

airClient™ TOTAL 551 Series

sB3416-01 / sB3416-02 / sB3416-03



User Guide

Version 1.0

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Congratulations on your purchase of sB product

Your airClient™ TOTAL 551 unit is designed so that you can set it up easily and be on your way to get unwired.

Important: Read all user instructions carefully before you use your device.

About This Document

This user guide is for the networking professional who installs, configures and manages the smartBridges' airClient™ TOTAL 551 series. Unless specifically stated, the configurations mentioned in the user guide are applicable to all the models of sB3416 (sB3416-01 / sB3416-02 / sB3416-03).

It provides detailed information on using the web-based configuration Graphics User Interface (GUI) to configure the airClient TOTAL sB3416 unit. This manual will help you gain a better understanding of how the various components of the sB3416 work.

To configure smartBridges' products, you need to have fundamental understanding of the concepts and technology of Local Area Networks (LAN) and wireless networking. The system installer will require expertise in the following areas:

- Outdoor radio equipment installation
- Network configuration
- Use of web browser for system configuration, monitoring and fault finding

In this chapter, you will find an overview of the user guide, and where to obtain additional information regarding installation and set-up.

Overview of User Guide

This document provides comprehensive information about the application needed to set up, configure and deploy the airClient TOTAL sB3416 unit. It is organized into several chapters:

Chapter 1:

- Configuration features
- System requirements

Chapter 2:

- Deploying the airClient TOTAL 551 in Router or NAT or Bridge (sB3416-03 only) modes
- Modify of various configuration settings

Chapter 3:

- Process of configuration on the radio performance parameters
- Bandwidth Controller.

Chapter 4:

- Display of the wireless traffic statistics.

Chapter 5:

- The site survey tool
- The system configuration tools
- Backup/restore features
- Firmware upgrade steps
- Using the License Key feature for bandwidth upgrade on the unit.

The abbreviations and acronyms used in this user guide are explained in the Appendix.

Related Publications

In addition to this user guide, the following related publications provide complete information on the TOTAL series (airHaul™, airPoint™ and airClient™) of radio units:

- Quick Install Guide (QIG)
- Release Notes
- Technical Specification

All the information can also be found on our website at <http://www.smartbridges.com/>.

Technical Support Center

Comprehensive technical support by dedicated smartBridges engineers is available to all customers through the smartBridges support center website. The website provides updated tools and documents to help troubleshoot and resolve technical issues related to smartBridges products and technologies. To access the technical support resources, please visit the support center website at <http://www.smartbridges.com/support/>

For additional services and free downloads, you would need to register on the smartBridges support center website.



1. Introduction

This user manual will guide you through initial site preparation, installation, configuration, and troubleshooting of the airClient TOTAL 551 [sB3416] unit. A web-based management tool is provided to assist you to configure the airClient TOTAL unit for different purposes.

The airClient TOTAL web-based management tool provides you with the following features:

- System configuration
- Device operational mode configuration
- Ethernet and wireless IP configurations
- Radio parameter configuration
- Bandwidth management
- Traffic Statistics
- Site Survey
- Security
- User Management
- Link Budget Planning Calculator
- Upgrading the unit to higher bandwidth using License Key
- Converting from one model of sB3416 to another using License Key
- Saving/Restoring good configuration settings
- Restore to Default settings
- Firmware Upgrade

Note: Unless specifically stated, the configurations mentioned in the user guide are applicable to all the models of sB3416 (sB3416-01 / sB3416-02 / sB3416-03).

1.1. System Requirements

The following are the minimum system requirements for the airClient TOTAL web-based configuration management tool:

1. Operating System: Windows 98/2000/XP/NT or Linux
2. Connection to the Internet for downloading the latest firmware and Sun JRE
3. Web browser: either Internet Explorer 5.0 and higher, Netscape 7.2 and higher, Mozilla 1.7 and higher or Mozilla Firefox 0.8 and higher
4. SUN JRE: v1.5 and above. You may download it from <http://java.sun.com/j2se/1.5.0/download.jsp>

1.2. Checklists

Deployment time, link-up time and support time can be improved by adopting proper site survey analysis, link planning, pre-installation tests, and web-GUI familiarization. The following pre-installation and post-installation checklist attempts to give the installer the basic understanding on the points to consider for a wireless deployment.

Pre-Installation Checklist for airClient TOTAL

Organization Name/Site Name	
Address	
City	
State	
Zip Code	
Telephone Number	

Site Survey and Link Planning				
No	Parameters	Units	Site A	Site B
1	Regulatory Standard to be followed	FCC/ETSI		
2	Frequency Band	sB3416: 5.15-5.25 5.25-5.35 5.47-5.725 5.725-5.875		
3	Maximum Output Power as per the Regulatory Authority (EIRP)	100mW/1W/4W		
4	Latitude	Deg Min Sec		
5	Longitude	Deg Min Sec		
6	UPS Installed	Yes/No		
7	UPS specification if any	KVA		
8	Line Voltage	90V-264V AC,50-60 Hz		
9	Near Line of Site between sites	Yes/No		
10	Height of tower	Feet/Meters		
11	Required Throughput	Mbps		
12	Distance between sites	Miles/km		
13	Antenna Type	Internal/External		
14	Antenna Manufacturer	smartBridges/Other		
15	Gain of antenna	dBi		

16	Antenna Polarization	Horizontal/Vertical		
17	Beam width of antenna	Horizontal - deg		
		Vertical - deg		

No	Parameters	Units	Site A	Site B
18	Length of external cable connecting Radio and antenna	Feet/meters		
19	Fade Margin taken into account for link budgeting	Ideally between 15 to 20 dB		
20	Model of smartBridges airClient TOTAL equipment selected for a link. Please refer to note below for selecting the right equipment	sB3416		
21	Grounding- Earth to Neutral Voltage	Ideally less than 2 Volts		
22	Length of the Ethernet cable required for powering the unit	Feet/meters		
23	Choose the best channel which can be used with the help of the Site Survey Tool and scanning tools like Netstumbler	Specify channel number		

Pre Installation Lab Testing of Equipment				
No	Parameters	Units	Site A	Site B
1	Network diagram along with IP address of all the interfaces for link to be set up in place	Yes/No		
2	Availability of Quick Installation Guide	Yes/No		
3	Availability of User Guide and CD	Yes/No		
4	Ensure that all items listed in the "Package Contents" of Quick Installation Guide are included in the shipment	Yes/No		
5	Availability of Installation Kit	Yes/No		
6	Radio MAC address of Access Point	MAC ID no.		
7	Configured for pre-installation testing	Yes/No		
8	Ping response	ms		
9	Ping Success Rate	Percentage %		
10	Throughput test (Upload/Download)	Varies depending on the Bandwidth Control, signal strength, link quality and distance		

Note: Throughput for sB3416 Series

sB3416-01:

As much as 512 kbps data throughput with a range of up to 4 miles (6 km)

sB3416-02:

As much as 1 Mbps data throughput with a range of up to 4 miles (6 km)

sB3416-03:

As much as 3 Mbps data throughput with a range of up to 4 miles (6 km)

Signature of Engineer:	

Name:	
Email:	
Date:	

Post-Installation Checklist for airClient TOTAL

Organization Name/Site Name	
Address	
City	
State	
Zip Code	
Telephone Number	

General Configuration Information				
No	Parameters	Units	Site A	Site B
1	Radio operation mode	sB3416-01 / sB3416-02 : Router / NAT sB3416-03 : Bridge / Router / NAT		
2	SSID of a Radio	Up to 32 characters		
3	IP address of Ethernet Port	32-bit numeric address		
4	IP address of Wireless Port	32-bit numeric address		
5	RSSI	dBm (At present, 'Level' in the current firmware version)		
6	Channel selected for link			
7	Radio TX Output Power	0 to +18 dBm		
8	Model of smartBridges airClient TOTAL equipment selected for a link.	sB3416		
9	Antenna Type	Internal/External		
10	Antenna Manufacturer	smartBridges/Name of other manufacturer		
11	Antenna Polarization	Horizontal/Vertical		
12	Beam width of antenna	Horizontal – deg		
		Vertical – deg		
13	Antenna Gain	dBi		

Checklist				
No	Parameters	Units	Site A	Site B
1	Check the crimping of the Ethernet cable at both the ends	Yes/No		
2	Check the proper grounding of the antenna and equipment	Yes/No		
3	Ensure that there are no extreme bends or kinks in the cable	Yes/No		
4	Ensure Ethernet cable is not running near a sharp edge	Yes/No		
5	Ensure antenna is aligned to get the best RSSI and link quality	Yes/No		
6	Ping response	ms		
7	Ping success rate	Percentage		
8	Throughput test (Upload/Download)	Mbps		
9	Link stability based on observation for 1 hour	Yes/No		
10	Shielded RJ-45 cable to be used from POE to the unit	Yes/No		

Signature of Engineer:	
Name:	
Email:	
Installation Date:	
Commissioned Date:	

For the latest information on smartBridges products, please visit our website at: <http://www.smartbridges.com/>

2. airClient TOTAL Configuration

The airClient TOTAL sB3416-01 and sB3416-02 can work in either Router or NAT mode.
The airClient TOTAL sB3416-03 can work in one of the three modes: Bridge, Router or NAT.

The procedures for configuring the various parameters in each mode are outlined in this chapter. Some of the details on the technical terms, acronyms and abbreviations used can be found in Appendix A.

2.1. Administrator Login and License Agreement

The airClient TOTAL unit comes with a pre-configured default Ethernet (wired-side) IP address: **192.168.0.225** and subnet mask: **255.255.255.0**. This default device IP address should be used when accessing the device configuration management interface for the first time using a web-browser. The PC must be on the same subnet as the airClient TOTAL unit.

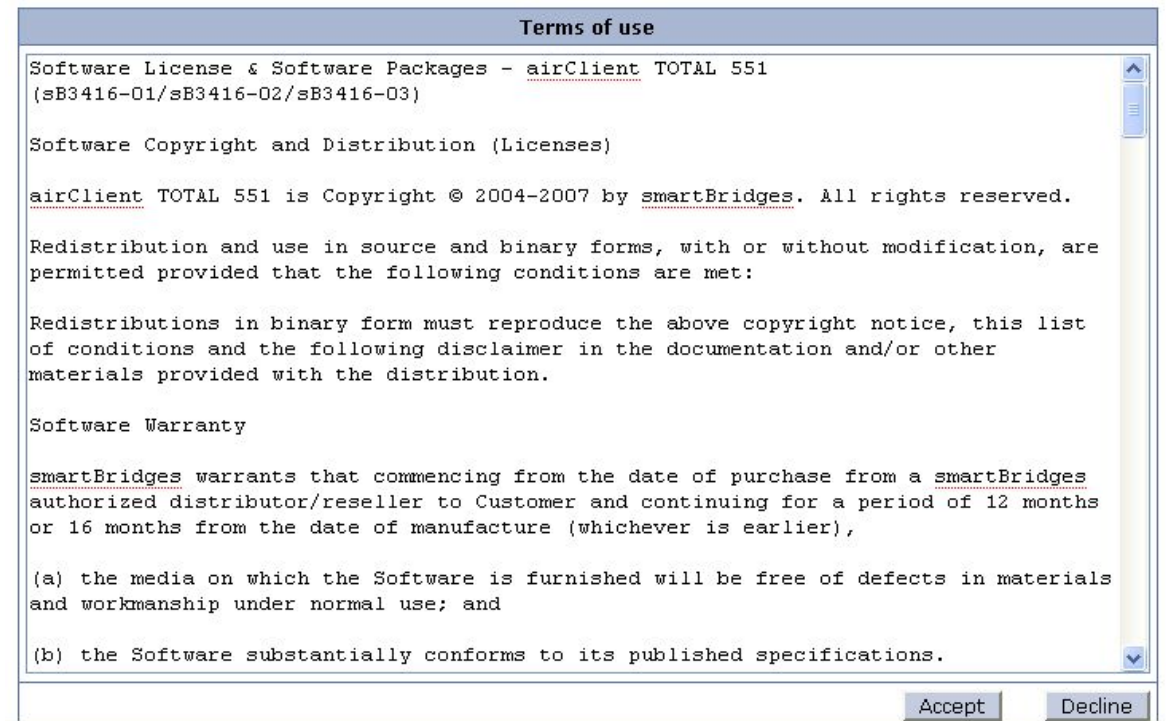
Follow the steps below to login as an Administrator to the web-based configuration management interface:

1. Connect the airClient TOTAL using the Power over Ethernet (PoE) to a PC or network via the ETH (Ethernet) port. (Please refer to the Quick Install Guide for more information on connections).
2. Open a web browser on the PC, type the default device IP address, (<http://192.168.0.225>) in the web browser address field, and press the **Enter** key.
3. A user login box as shown below (Fig 2-1) will appear. Enter the **User name** and **Password**. The default user name is **administrator** and the password is **smartBridges** (case sensitive).



Figure 2-1 airClient TOTAL Administrator Login

4. Click on the **OK** button. A license agreement page will appear as shown in Fig 2-2 below.
5. Click **Accept**. The airClient TOTAL **Summary Information** page (Fig 2-3) will appear.

Terms of use :

Terms of use

Software License & Software Packages - airClient TOTAL 551
(sB3416-01/sB3416-02/sB3416-03)

Software Copyright and Distribution (Licenses)

airClient TOTAL 551 is Copyright © 2004-2007 by smartBridges. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

Software Warranty

smartBridges warrants that commencing from the date of purchase from a smartBridges authorized distributor/reseller to Customer and continuing for a period of 12 months or 16 months from the date of manufacture (whichever is earlier),

(a) the media on which the Software is furnished will be free of defects in materials and workmanship under normal use; and

(b) the Software substantially conforms to its published specifications.

Figure 2-2 airClient TOTAL License Agreement Page

Home : Summary Information

airClient TOTAL (sB3416-03) - [NAT mode](#)

LAN Settings	
LAN IP Mode	Static IP
System Name	SB3416-03
IP Address	192.168.0.225
Subnet Mask	255.255.255.0

WLAN Settings	
WLAN Type	Static
IP Address	192.168.2.225
Network Mask	255.255.255.0
Gateway Address	192.168.2.254
DNS Server	192.168.0.225
Secondary DNS	0.0.0.0

Wireless Settings	
SSID	NEXUS_MASTER
Channel	Current Channel 52: 5260MHz
Association Status	Not Associated
Wireless Mode	802.11a
Security Mode	Disable
Authentication	Open System
Data Rate(Mbps)	Best
Transmit Power	18dBm
Preamble	Long Preamble
Slot Time	Short Slot Time

DHCP Server Settings	
DHCP Server	Disable
Address Pool	System Define
Start Address	0.0.0.0
End Address	0.0.0.0
Lease Time	2880 Minute(s)

NAT	
Virtual Server	0 Entri(es)

Routing Setting	
Static Routing	0 Entri(es)

Figure 2-3 airClient TOTAL Summary Information Page

The descriptions of the fields in the **Summary Information** page are provided in the table (Table 2-1) below:

Table 2-1 Description of the field items in the 'Summary Information' page

Field Items on Summary Info page		Descriptions
LAN Settings	LAN IP Mode	Set to Static IP by default
	System Name	This is the user defined name of the unit
	IP Address	Ethernet IP Address.
	Subnet Mask	Ethernet IP subnet Mask
WLAN Settings	WLAN Type	Static IP or Dynamic IP
	IP Address	Wireless IP address
	Network mask	Wireless IP Mask
	Gateway Address	Wireless IP Gateway
	DNS Server	Primary DNS Server
	Secondary DNS	Secondary DNS Server
Wireless Settings	SSID	Displays the SSID currently set for the device. This is the public name of the wireless link
	Channel	Displays the channel at which the Client is associated
	Association Status	Displays Associated or Not Associated status
	Wireless Mode	Wireless operating mode (802.11a)
	Security Mode	Displays if security is Enabled or Disabled
	Authentication	Open System / Shared Key / WPA-PSK
	Data Rate (Mbps)	This indicates the rate at which the radio has been asked to operate by the user.
	Transmit Power	This is used to set the output power of the radio.
	Preamble	The radio preamble is a section of data at the head of a packet. The preamble contains information that the radio needs when sending and receiving packets
	Slot Time	This can be set to Long Short time or Short time
DHCP Server Settings	DHCP Server	Displays if DHCP Server is Enabled or Disabled
	Address Pool	Allows the Address Pool to be System defined or User defined
	Start Address	The Starting address of the DHCP Client IP Address pool
	End Address	The Ending address of the DHCP Client IP Address pool
	Lease Time	The maximum time of the DHCP Leases. The maximum allowable limit is 2880 minutes.
NAT	Virtual Server	Displays the no. of entries in the IP/Port Forwarding Table
Routing Setting	Static Routing	Displays the no. of static routes in the Static Routing Table

2.2. Web GUI Administrator User Name and Password Change

The default administrator user name for the airClient TOTAL 3416 is **administrator** and administrator password is **smartBridges** (please note that this is case sensitive).

Follow the steps below to change the administrator user name and/or password:

1. From the top navigation menu bar, click on **Tools | System Admin.** A System Administration interface will appear as shown below.
2. Enter the user name you wish in the **User Name** field.
3. Enter the new password in **Password** and **Verify Password** fields. Click on the **Save** button to save the settings.
4. Click on the **Save** button and a message box will appear to confirm if you wish to reboot the unit. Click OK to reboot the unit, and the new user name and password to take effect.

Tools : System Administration

airClient TOTAL (sB3416-03) - [NAT mode](#)

System Administration	
User Name	<input type="text" value="administrator"/>
Password	<input type="password" value=""/>
Verify Password	<input type="password" value=""/>

Figure 2-4 airClient TOTAL Administrator User Name/Password Change

2.3. Using the Configuration Pages

The airClient TOTAL configuration system comprises several pages for configuring each parameter. A common navigation menu bar is provided at the top of each page for easy navigation as shown in the figure below (Figure 2-5).

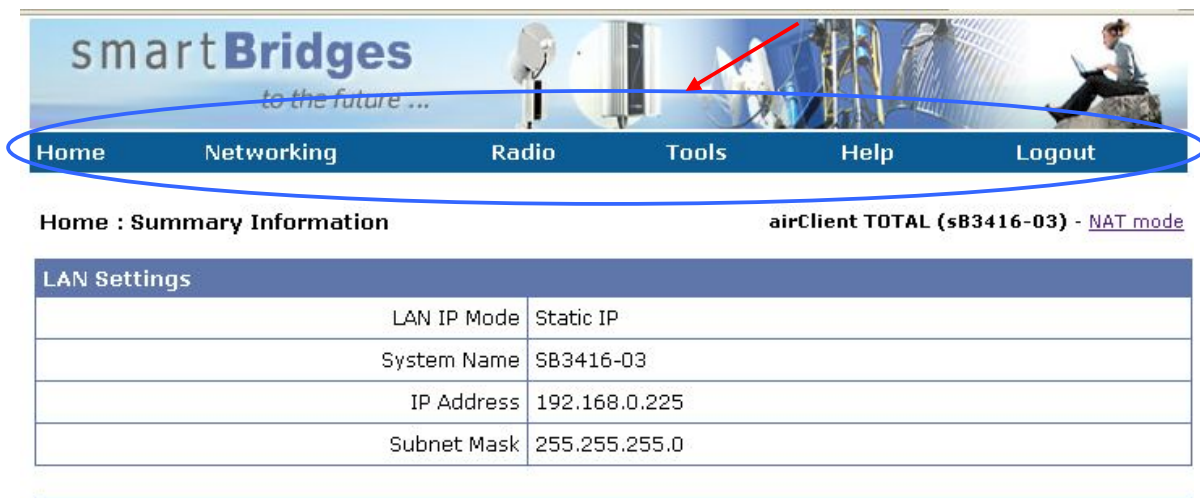


Figure 2-5 airClient TOTAL Navigation Menu Bar

The Navigation menu bar contains menu items that allow the user to go to different configuration pages. The following table (Table 2-2) summarizes the functions available for the menu item links.

Table 2-2 Description of Menus

Menu Item	Menu Sub-items	Description
Home	Summary Information	Displays <i>read-only</i> summary page with information such as LAN Settings, WLAN Settings, Wireless Settings, DHCP Server Settings, Virtual Server and Routing Table Entries.
	LAN Settings	Allows user to set system name of the unit, IP Address and subnet mask on the wired side. Allows the user to set the gateway if the unit is in Bridge Mode (Note: This is only applicable for 3416-03 model).
	WLAN Settings	Allows user to set IP address, mask, gateway on the wireless side. Allows user to Enable or Disable DNS Passthrough. Allows user to set the Primary/Secondary DNS Server.

Menu Item	Menu Sub-items	Description
Networking	Wireless Statistics	Displays traffic statistics on the Wireless side
	Association Status	Shows the status of the association and the MAC of the AP associated with. Shows the Link Status Graph for the associated link.
	DHCP	Allows user to Enable or Disable DHCP Server Allows user to Enable/Disable DHCP Relay (Note: DHCP Relay feature is only applicable for the 3416-03 model).
	DHCP List	Displays the DHCP List; if DHCP Server is Enabled
	IP/Port Forwarding	Allows user to add entries to map Local Area Network IP Address (or port) behind the NAT to a global port accessible through the wireless interface. User will be able to use this option only when the unit is configured in the NAT mode.
	Routing Table	Allows the user to view, add and delete or update static routes. Allows the user to Enable or Disable RIP running on the device. RIPv2 is run by default on the device.
	Bandwidth Control	Allows bandwidth management of the wireless link
Radio	Wireless Settings	Allows the user to set SSID, Enable or Disable SSID Suppressed, select Internal or External antenna, configure Distance, select Data Rate, set Transmit Power, set Country settings, Preamble and Slot time
	Security	<p>Security: Allows user to set the security mode for the device. User can choose Open System, Shared, or WPA-PSK.</p> <p>Open System / Shared Key:</p> <ul style="list-style-type: none"> Allows Allow user to turn on encryption using WEP at 64 or 128 bits and choose between Open Systems and Shared Key. <p>WPA-PSK: This mode allows user to use WPA pre-shared key and cipher as TKIP or AES for client authentication.</p>

Menu Item	Menu Sub-items	Description
		Note: By default, the Security mode is Disabled. AES security mode is only available in 3416-03 model.
Tools	System Configuration	Allows user to switch the operation mode between Bridge (sB3416-03 Only), Router or NAT mode. Allows the user to Reset the unit, Restore unit to Factory defaults.
	SNTP Setting	Allows user to set the Network Time Server and the Time Zone.
	Site Survey	Shows all the standards based wireless devices operating in the area.
	System Admin	Allows user to change the Administrator user name and/or password.
	System User	Allows read only users to added, and their user names/passwords to be changed.
	SNMP Configuration	This allows the user to Enable/Disable SNMP, and set Read/Write community strings.
	Backup/Restore Settings	Allows user to save or restore good settings, backup the configuration file and upload it later, do a Factory Reset on the unit.
	Firmware Upgrade	Allows the user to upgrade/downgrade the firmware on the unit
	Product License Key	Allows the user to upgrade the unit to higher bandwidth or to convert the model from 3416-01 to 3416-02 / 3416-03, or vice versa.
	Link Budget Planning	Allows user to calculate the Link Budget between an airClient TOTAL unit and an Access Point.
	System Log	Allows user to display the system log locally or remotely. Currently, this device will only log in case of any problems with the unit.
	Reboot	Allows user to reboot the unit. Note: All changes made to the unit will take effect only after a Reboot is done.

Menu Item	Menu Sub-items	Description
Help	Technical Support	Information on Technical Support
	User Guide – Online	Link to online user guide
	Product Registration and Feedback	Allows user to register product and provide feedback or suggestions.
	Check for Updates	Checks smartBridges website for any software updates.
	About airClient TOTAL	General system description, software version information and warranty information.
Logout	Logout	Allows user to logout from the airClient TOTAL device.

2.4. Device Mode Configuration

The device operational mode is displayed at the top right hand corner of each page. The device mode configuration allows the user to configure the airClient TOTAL to a NAT (Network Address Translation) mode or Router mode for 3416-01 and 3416-02 models, and NAT or Router or Bridge mode for the 3416-03 model. These modes are explained below.

NAT: This is the default operating mode. This mode allows you to use one segment of private IP addresses for multiple hosts to access the external network using a single wireless IP address. This translation helps in protecting the access of internal hosts from external network. This mode is available in all sB3416 models.

Router: This mode allows you to configure different segment of IP address in Ethernet and Wireless interface. A standard routing functionality is available in this mode. This mode is available in all sB3416 models.

Bridge: This mode allows you to configure both WDS and non-WDS modes in bridge mode. In non-WDS Client Bridge mode, sB3416-03 can be configured for both Non-transparent and transparent bridging. The bridge modes are only available in sB3416-03 model.

System Configuration :

airClient TOTAL (sB3416-03) - NAT mode

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B0P3_SB3416-03
Local MAC Address	00:30:1a:39:48:3c
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input type="radio"/> Bridge <input type="radio"/> Router <input checked="" type="radio"/> NAT	<input type="button" value="Save"/>

Figure 2-6 airClient TOTAL Device Mode Configuration

2.5. Changing from NAT to Router Mode

The default configuration of the airClient TOTAL is in the NAT mode.

Follow the steps below to change the airClient TOTAL from the default NAT mode to Router mode:

1. From the navigation menu bar, click on **Tools | System Configuration**. The **System Configuration** page will appear as shown below.
2. Under the **Current Operational Mode**, choose the operation mode **Router**.
3. Click on **Save** to reboot the unit and convert to Router mode.
4. The **IP Address**, **IP Mask** and **Gateway** for **LAN Settings** and **WLAN Settings** remain the same in the Router mode as it was in the NAT mode.

System Configuration : airClient TOTAL (sB3416-03) - [NAT mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B0P3_SB3416-03
Local MAC Address	00:30:1a:39:48:3c
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input type="radio"/> Bridge <input checked="" type="radio"/> Router <input type="radio"/> NAT	<div>Save</div>

Figure 2-7 Changing NAT Mode to Router Mode

2.6. Changing from Router to NAT Mode

Follow the steps below to change the airClient TOTAL from Router Mode to NAT Mode:

1. From the navigation menu bar, click on **Tools | System Configuration**. The **System Configuration** screen will appear as shown below.
2. Under the **Current Operational Mode**, choose the operation mode **NAT**.
3. Click on **Save** to reboot the unit and convert to NAT mode.
4. The **IP Address**, **IP Mask** and **Gateway** for **Ethernet Configuration** and **Wireless Configuration** remains the same in the NAT mode as it was in the Router mode.

System Configuration : airClient TOTAL (sB3416-03) - [Router mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1a:39:48:3c
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input type="radio"/> Bridge	<input type="radio"/> Router
<input checked="" type="radio"/> NAT	<input type="radio"/> Save

Figure 2-8 Changing Router Mode to NAT Mode

2.7. Changing from Router/NAT to Bridge Mode (sB3416-03 Only)

This section is only valid for the sB3416-03 model. Follow the steps below to change the airClient TOTAL from the Router or NAT mode to Bridge mode:

1. From the navigation menu bar, click on **Tools | System Configuration**. The **System Configuration** screen will appear as shown below.

2. Under the **Current Operational Mode** settings, choose **Bridge** option. (Note: IP Mux Enable/Disable options can be left as default for now. More on this will be covered in Bridge Mode Configuration, covered in Section 2-9).
3. Click on **Save** to convert the unit to Bridge mode.
4. The Bridge Mode on sB3416 can be configured to operate in WDS and non-WDS modes. For all the configuration settings in different Bridge Modes, refer to Section 2.9.

System Configuration :

airClient TOTAL (sB3416-03) - [Router mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1a:39:48:3c
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input checked="" type="radio"/> Bridge <input type="radio"/> Router <input type="radio"/> NAT <input type="radio"/> IPMux Enable <input checked="" type="radio"/> IPMux Disable	<input type="button" value="Save"/>

Figure 2-9 Changing Router/NAT Mode to Bridge Mode (sB3416-03 only)

2.8. Changing from Bridge to Router/NAT Mode (sB3416-03 Only)

This section is only valid for the sB3416-03 model. Follow the steps below to change the airClient TOTAL from the Bridge mode to Router/NAT mode.:

1. From the navigation menu bar, click on **Tools | System Configuration**. The **Operation Mode** screen will appear as shown below.
2. Under the **Current Operational Mode** settings, choose **Router** or **NAT** option.
3. Click on **Save** to reboot the unit and to convert the unit to Router/NAT mode.
4. To configure the Wired parameters, see Section 2.10.1
5. To configure the WLAN IP and Radio parameters, like SSID, see Section 2.10.2

System Configuration :**airClient TOTAL (sB3416-03) - [Bridge mode](#)**

System Configuration	
System Name	<input type="text" value="SB3416-03"/>
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1A:39:48:3C
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input type="radio"/> Bridge	<input checked="" type="radio"/> Router
<input type="radio"/> NAT	<input type="button" value="Save"/>

Figure 2-10 Changing Bridge Mode to Router (or NAT) Mode (sB3416-03 Only)

2.9. airClient TOTAL Bridge Configuration (sB3416-03 only)

This section is only valid for the sB3416-03 model.

The sB3416-03 can be configured in both WDS and non-WDS modes, while in Bridge Mode. In WDS mode, 3416 functions as a transparent bridge. In non-WDS client bridge mode, 3416 can be configured for both non-transparent and transparent bridging.

This section covers the configuration of the sB3416-03 in all possible bridge modes.

2.9.1. WDS Bridge Mode

Wireless Distribution System (WDS) is a system that provides a means to extend the range of Wireless Local Area Network. To create a WDS link, peer MAC addresses need to be exchanged and all stations in WDS should be configured to use the same radio channel and configured to use the same WEP keys, if they are used.

The sB3416-03 can be configured to operate in the WDS Bridge Mode. The airClient TOTAL in WDS Bridge mode can associate only with a smartBridges airPoint access point in bridge mode, as they both use WDS link implementation.

Find below all the settings that need to be done in WDS Bridge Mode –

System Configuration

Follow the steps below to configure the sB3416-03 unit for WDS Bridge Mode –

-
1. From the navigation menu bar, click on **Tools | System Configuration**.
 2. In the Current Operational Mode, click on **IP Mux Disable** radio button, if not already selected. (Note: This button selection will enable the **Remote AP MAC Address** and **Channel** fields in the **Wireless Settings** of the Bridge mode, as covered in Radio Settings below, and Fig 2-13).
 3. Click on **Save** to save the changes. The settings will be applied after the reboot.
-

System Configuration :
airClient TOTAL (sB3416-03) - [Bridge mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1A:39:48:3C
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input checked="" type="radio"/> Bridge <input type="radio"/> Router <input type="radio"/> NAT <input type="radio"/> IPMux Enable <input checked="" type="radio"/> IPMux Disable	Save

Figure 2-11 airClient TOTAL WDS Bridge Mode Configuration (sB3416-03 Only)

LAN Settings

This section outlines the procedures for changing the IP settings for bridge mode –

1. From the navigation menu bar, click on **Home | LAN Settings** to change IP address and mask of the unit in bridge mode. The **LAN Settings** screen will appear as shown below in Fig 2-12.
2. Enter the **System Name** of the unit, if needed.
3. Enter the **IP address** and **Subnet mask** to set the IP address and subnet mask, and any **Gateway Address** if required. Assign the unit a unique IP Address in the designated IP subnet.
4. Click on **Save** to save the changes. The settings will be applied after the reboot.

Home : LAN Setting
airClient TOTAL (sB3416-03) - [Bridge mode](#)

LAN Setting	
IP Mode	<input checked="" type="radio"/> Static IP <input type="radio"/> Dynamic IP (DHCP Client)
System Name	SB3416-03
IP Address	192.168.0.225
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0

[Save](#)
[Reset](#)

Figure 2-12 airClient TOTAL Bridge LAN Settings (sB3416-03 Only)

Radio Settings

Follow the steps below to configure the Radio parameters in the airClient TOTAL Bridge Mode, specifically for WDS operating mode :

1. From the navigation menu bar, click on **Radio | Wireless Settings** to set the radio parameters. The **Wireless Settings** screen will be displayed as shown in Fig 2-13.
2. Set the **SSID**, and the **wireless mode** to 802.11 a.
3. Enter the **MAC address of the remote AP** (Note: This is mandatory to set when the unit is converted to WDS Bridge Mode)
4. Set the **Channel** to the channel setting of the Access Point. (Note: This is mandatory to set when the unit is converted to WDS Bridge Mode).
5. For the **Antenna Selection**, choose either Internal or External antenna, as per the requirement.
6. Select the **Country** for the domain settings.
7. Configure the **Distance** parameter to configure the Ack Window.
8. Select the **Data Rate** from the drop down menu. By default, the data rate is set to **Best**.
9. Set the **Default Data Rate** to set the data rate for transmitting beacons, broadcast and multicast traffic. By default, this rate is set to **1 Mbps**.
10. Select the **Transmit power** of the radio from the drop down menu.
11. Select the **Preamble** to be Long or Short. By default the preamble is set to **Long**.
12. Click on **Save** to reboot and for the settings to take effect. The unit will attempt to associate after the Reboot.

Note: The **Association Status** field in the Wireless Settings of the Summary Information page will show the status as **Associated** if the unit has associated successfully, as shown in Fig 2-14a below. Under **Networking | Association Status**, the status will also show the Access Point that the client is associated with, as shown in Fig 2-14b below.

Radio : Advanced Settings

airClient TOTAL (sB3416-03) - [Bridge mode](#)

Advanced Setting	
SSID	NEXUS_MASTER
SSID suppressed	<input type="radio"/> Yes <input checked="" type="radio"/> No
Channel	SmartSelect
Remote AP MAC Address	00:30:1a:29:00:d0
Wireless Mode	5GHz 54Mbps (802.11a)
Antenna Selection	<input checked="" type="radio"/> Internal <input type="radio"/> External
Distance:	Within 1Km
Country:	UNITED STATES - US
Data Rate(Mbps)	Best
Default Data Rate(Mbps)	1
Transmit Power	18 dBm
Preamble	Long Preamble
Slot Time	Short Slot Time
Protection Mode	None
Protection Type	<input checked="" type="radio"/> CTS-only <input type="radio"/> RTS-CTS
RTS/CTS Threshold	2346

Figure 2-13 airClient TOTAL Bridge Radio Settings – WDS Bridge mode (sB3416-03 Only)

Wireless Settings	
SSID	Nexus_Master_Root
Channel	Current Channel 52: 5260MHz
Association Status	Associated
Wireless Mode	802.11a

Figure 2-14a airClient TOTAL Summary Information Page

Networking : Association Status

airClient TOTAL (sB3416-03) - [NAT mode](#)

ID	MAC Address	Status	Signal Strength(RSSI)	NoiseFloor	
0	00:30:1A:1F:4A:2E	up	-55 dBm	-96 dBm	Show graph

Figure 2-14b airClient TOTAL Wireless Association Status

2.9.2. Client Bridge Mode (Non-WDS)

The sB3416-03 can also be configured to operate in the non-WDS Bridge Mode. It is said to be operating in the Client Bridge mode in this configuration. The airClient TOTAL can associate with any Access Point in this bridge mode. The Client Bridge mode can be configured for both Non-Transparent and Transparent bridging. In Non-Transparent bridging, you can connect more than 1 device behind the airClient TOTAL unit. In Transparent bridging, only a single device can be connected behind the airClient TOTAL unit.

Find below all the settings that need to be done in both Client Bridge Modes.

Non-Transparent Bridging (MAC Translation)

This configuration supports multiple devices behind the airClient TOTAL sB3416 device.

System Configuration

Follow the steps below to configure the sB3416-03 unit for Non-Transparent Bridging –

1. From the navigation menu bar, click on **Tools | System Configuration**.
2. In the Current Operational Mode, click on **IP Mux Enable** radio button.. (Note: This button selection will disable the **Remote AP MAC Address** and **Channel** fields in the **Wireless Settings** of the Bridge mode, as covered in Radio Settings below, and Fig 2-17).
3. Click on **Save** to save the changes. The settings will be applied after the reboot.

System Configuration :

airClient TOTAL (sB3416-03) - [Bridge mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1A:39:48:3C
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input checked="" type="radio"/> Bridge <input type="radio"/> Router <input type="radio"/> NAT <input checked="" type="radio"/> IPMux Enable <input type="radio"/> IPMux Disable	<div>Save</div>

Figure 2-15 airClient TOTAL - Non-Transparent bridging Configuration (sB3416-03 Only)

LAN Settings

This section outlines the procedures for changing the IP settings for bridge mode. These settings are the same in all possible bridge modes –

1. From the navigation menu bar, click on **Home | LAN Settings** to change IP address and mask of the unit in bridge mode. The **LAN Settings** screen will appear as shown below in Fig 2-16.
2. Enter the **System Name** of the unit, if needed.
3. Enter the **IP address** and **Subnet mask** to set the IP address and subnet mask, and any **Gateway Address** if required. Assign the unit a unique IP Address in the designated IP subnet.
4. Click on **Save** to save the changes. The settings will be applied after the reboot.

Home : LAN Setting airClient TOTAL (sB3416-03) - [Bridge mode](#)

LAN Setting	
IP Mode	<input checked="" type="radio"/> Static IP <input type="radio"/> Dynamic IP (DHCP Client)
System Name	SB3416-03
IP Address	192.168.0.225
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0

Figure 2-16 airClient TOTAL Bridge LAN Settings (sB3416-03 Only)

Radio Settings

Follow the steps below to configure the Radio parameters in the airClient TOTAL Bridge Mode, for Non-Transparent bridging :

1. From the navigation menu bar, click on **Radio | Wireless Settings** to set the radio parameters. The **Wireless Settings** screen will be displayed as shown in Fig 2-17.
2. Set the **SSID**, and the **wireless mode** to 801.11a.
3. The **Remote AP MAC Address** should be set to 00:00:00:00:00:00.
4. The **Channel** field will be set to **SmartSelect** in this mode. (Note: The channel is not configurable in this mode, and will follow the channel of the Access Point, it is associated with.)
5. For the **Antenna Selection**, choose either Internal or External antenna, as per the requirement.
6. Select the **Country** for the domain settings.
7. Configure the **Distance** parameter to configure the Ack Window.
8. Select the **Data Rate** from the drop down menu. By default, the data rate is set to **Best**.

9. Set the **Default Data Rate** to set the data rate for transmitting beacons, broadcast and multicast traffic. By default, this rate is set to **1 Mbps**.
10. Select the **Transmit power** of the radio from the drop down menu.
11. Select the **Preamble** to be Long or Short. By default the preamble is set to **Long**.
12. Click on **Save** to reboot and for the settings to take effect. The unit will attempt to associate after the Reboot.

Radio : Advanced Settings airClient TOTAL (sB3416-03) - [Bridge mode](#)

Advanced Setting	
SSID	Nexus_Master_Root
SSID suppressed	<input type="radio"/> Yes <input checked="" type="radio"/> No
Channel	SmartSelect
Remote AP MAC Address	00:00:00:00:00:00
Wireless Mode	5GHz 54Mbps (802.11a)
Antenna Selection	<input checked="" type="radio"/> Internal <input type="radio"/> External
Distance:	Within 1Km
Country:	UNITED STATES - US
Data Rate(Mbps)	Best
Default Data Rate(Mbps)	1
Transmit Power	18 dBm
Preamble	Long Preamble
Slot Time	Short Slot Time
Protection Mode	None
Protection Type	<input checked="" type="radio"/> CTS-only <input type="radio"/> RTS-CTS
RTS/CTS Threshold	2346

Figure 2-17 airClient TOTAL Bridge Radio Settings – Non-Transparent bridging (sB3416-03 Only)

Note : In non-transparent bridging configuration, when airClient TOTAL is associated, the MAC addresses seen on the AP Association table, will be the MAC address of the sB3416-03 device, and not of the devices behind the sB3416-03 unit.

Transparent Bridging (Single MAC Only)

This configuration supports single device connection behind the airClient TOTAL sB3416-03 unit.

System Configuration

Follow the steps below to configure the sB3416-03 unit for Transparent Bridging –

1. From the navigation menu bar, click on **Tools | System Configuration**.
2. In the Current Operational Mode, click on **IP Mux Disable** radio button.
3. Click on **Save** to save the changes. The settings will be applied after the reboot.

System Configuration : airClient TOTAL (sB3416-03) - [Bridge mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B1P0_SB3416-03
Local MAC Address	00:30:1A:39:48:3C
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode	
<input checked="" type="radio"/> Bridge <input type="radio"/> Router <input type="radio"/> NAT <input type="radio"/> IPMux Enable <input checked="" type="radio"/> IPMux Disable	<div style="text-align: right;"> <input type="button" value="Save"/> </div>

Figure 2-18 airClient TOTAL Transparent Bridging Configuration (sB3416-03 Only)

LAN Settings

This section outlines the procedures for changing the IP settings for bridge mode. These settings are the same in all possible bridge modes –

1. From the navigation menu bar, click on **Home | LAN Settings** to change IP address and mask of the unit in bridge mode. The **LAN Settings** screen will appear as shown below in Fig 2-19.
2. Enter the **System Name** of the unit, if needed.

3. Enter the **IP address** and **Subnet mask** to set the IP address and subnet mask, and any **Gateway Address** if required. Assign the unit a unique IP Address in the designated IP subnet.
4. Click on **Save** to save the changes. The settings will be applied after the reboot.

Home : LAN Setting airClient TOTAL (sB3416-03) - [Bridge mode](#)

LAN Setting	
IP Mode	<input checked="" type="radio"/> Static IP <input type="radio"/> Dynamic IP (DHCP Client)
System Name	SB3416-03
IP Address	192.168.0.225
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0

Figure 2-19 airClient TOTAL Bridge LAN Settings (sB3416-03 Only)

Radio Settings

Follow the steps below to configure the Radio parameters in the airClient TOTAL Bridge Mode, for Transparent bridging :

1. From the navigation menu bar, click on **Radio | Wireless Settings** to set the radio parameters. The **Wireless Settings** screen will be displayed as shown in Fig 2-20.
2. Set the **SSID**, and the **wireless mode** to 802.11a.
3. The **Remote AP MAC Address** should be set to 00:00:00:00:00:00. (Note: This setting differentiates the Client Bridge mode from the WDS bridge mode, when IP Mux is Disabled).
4. The **Channel** field should be set to **SmartSelect** in this mode. (Note: The channel in **SmartSelect** setting will follow the channel of the Access Point, it is associated with.)
5. For the **Antenna Selection**, choose either Internal or External antenna, as per the requirement.
6. Select the **Country** for the domain settings.
7. Configure the **Distance** parameter to configure the Ack Window.
8. Select the **Data Rate** from the drop down menu. By default, the data rate is set to **Best**.
9. Set the **Default Data Rate** to set the data rate for transmitting beacons, broadcast and multicast traffic. By default, this rate is set to **1 Mbps**.
10. Select the **Transmit power** of the radio from the drop down menu.
11. Select the **Preamble** to be Long or Short. By default the preamble is set to **Long**.
12. Click on **Save** to reboot and for the settings to take effect. The unit will attempt to associate after the Reboot.

Radio : Advanced Settings

airClient TOTAL (sB3416-03) - [Bridge mode](#)

Advanced Setting	
SSID	Nexus_Master_Root
SSID suppressed	<input type="radio"/> Yes <input checked="" type="radio"/> No
Channel	SmartSelect
Remote AP MAC Address	00:00:00:00:00:00
Wireless Mode	5GHz 54Mbps (802.11a)
Antenna Selection	<input checked="" type="radio"/> Internal <input type="radio"/> External
Distance:	Within 1Km
Country:	UNITED STATES - US
Data Rate(Mbps)	Best
Default Data Rate(Mbps)	1
Transmit Power	18 dBm
Preamble	Long Preamble
Slot Time	Short Slot Time
Protection Mode	None
Protection Type	<input checked="" type="radio"/> CTS-only <input type="radio"/> RTS-CTS
RTS/CTS Threshold	2346

Figure 2-20 airClient TOTAL Bridge Radio Settings –Transparent bridging (sB3416-03 Only)

Note :

In Transparent bridging configuration, when airClient TOTAL is associated, the MAC address seen on the AP Association table, will be the MAC address of the device connected behind the sB3416-03 device.

Note:

To summarize, the sB3416 Bridge Modes of WDS and Client Bridge Modes differ only in the presence of a MAC address in the **Remote AP MAC Address** field on the **Radio | Wireless Settings** page. If the **Remote AP MAC Address** is a valid MAC, the 3416 is said to be in the WDS bridge mode. If the **Remote AP MAC Address** is 00:00:00:00:00:00 in Bridge Mode, the 3416 is said to be in Client Bridge Mode.

2.10. airClient TOTAL Router / NAT Configuration

This section covers the procedures for configuring various parameters in the Router and NAT modes.

2.10.1. LAN Settings

The LAN and the WLAN settings are maintained in two different subnets.

Follow the steps below to re-configure the airClient TOTAL Router/NAT Ethernet parameters:

1. From the navigation menu bar, click on **Home | LAN Settings** to change Ethernet/wired side parameters. The **LAN Settings** screen will appear as shown below.
2. Enter the **System Name** of the unit, if required.
3. Enter the **IP address** and **Subnet mask** to set the LAN IP address and subnet mask.
4. Click on **Save** to apply the settings.

Home : LAN Setting airClient TOTAL (sB3416-03) - [NAT mode](#)

LAN Setting	
System Name	SB3416-03
IP Address	192.168.0.225
Subnet Mask	255.255.255.0

Figure 2-21 airClient TOTAL Router/NAT LAN Settings

2.10.2. WLAN Settings

The wireless parameters need to be configured to allow the airClient TOTAL unit to associate with an airPoint™ Nexus device or any other third party wireless access point.

Follow the steps below to configure the airClient TOTAL Router/NAT Mode Wireless IP Settings parameters:

1. From the navigation menu bar, click on the **Home | WLAN Settings** to set the wireless parameters for the unit. The **WLAN Settings** screen will be displayed as shown below.
2. Select the **Dynamic** checkbox if the IP address can be obtained automatically from the wireless link; else select the **Static** checkbox to manually configure the wireless IP/mask.
3. For Static Connection Type, enter the wireless **IP Address**, **Network Mask**, **Gateway Address** for the airClient TOTAL unit.
4. For Dynamic Connection Type, select the Connection Type as **Dynamic**. When connection type is changed to **Dynamic**, two buttons **Request** and **Release** will appear, as shown below in Figure 2.23. Click on the Request button to get the dynamic IP addresses from the DHCP Server. If the unit is associated, IP addresses will appear in the IP Address, Subnet Mask and Gateway Address fields. Click on **Release** button to release the assigned IP addresses.
5. To enable DNS Passthrough, check the **DNS Passthrough** checkbox.
6. Set the **Primary/Secondary DNS Server**, as required.
7. Click on **Save** to apply the settings.

Home : WLAN Setting
airClient TOTAL (sB3416-03) - NAT mode

WLAN Setting	
Connection Type	<input type="radio"/> Dynamic <input checked="" type="radio"/> Static
IP Address	192.168.2.225
Network Mask	255.255.255.0
Gateway Address	192.168.2.254
MTU	1500
<input type="checkbox"/> DNS Passthrough	
<input checked="" type="checkbox"/> Manually Set DNS	
DNS Server	192.168.0.225
Secondary DNS	0.0.0.0

Save
Reset

Figure 2-22 airClient TOTAL Router/NAT WLAN Settings – Static WLAN connection

Home : WLAN Setting

airClient TOTAL (sB3416-03) - [NAT mode](#)

WLAN Setting	
Connection Type	<input checked="" type="radio"/> Dynamic <input type="radio"/> Static
IP Address	192.168.2.225
Network Mask	255.255.255.0
Gateway Address	192.168.2.254
MTU	1500
<input type="checkbox"/> DNS Passthrough	
<input type="checkbox"/> Manually Set DNS	
DNS Server	192.168.0.225
Secondary DNS	0.0.0.0
<div>Request Release</div> <div>Save Reset</div>	

Figure 2.23 airClient TOTAL Router/NAT WLAN Settings – Dynamic WLAN Connection

For the airClient TOTAL device to associate with an access point, the user also needs to configure the access point's SSID, security (if used), and select External/Internal antenna options.

Follow the steps below to configure the airClient TOTAL Router/NAT Mode wireless association parameters:

1. From the navigation menu bar, click on **Radio | Wireless Settings** to set the SSID and wireless mode (802.11 a). The **Wireless Settings** screen will be displayed as shown in Fig 2-24.
2. Set the **SSID**, and the **wireless mode** to 802.11 a.
3. The **Channel** selection is disabled in the Router/NAT mode. The airClient unit, once associated, will follow the corresponding AP.
4. The **Remote AP MAC Address** can be set to 00:00:00:00:00:00 in case the association is only to be based on the SSID. Or, the **Remote AP MAC Address** can be set to a specific AP MAC Address, in case the airClient TOTAL unit needs to be associated with a specific Access Point.
5. For the **Antenna Selection**, choose either Internal or External antenna, as per the requirement.
6. Select the **Country** for the domain settings.
7. Configure the **Distance** parameter to configure the Ack Window.
8. Select the **Data rate** from the drop down menu. By default, the data rate is set to **Best**.
9. Select the **Transmit power** of the radio from the drop down menu.
10. Select the **Preamble** to be Long or Short. By default the preamble is set to Long.
11. Click on **Save** to reboot and for the settings to take effect. The unit will attempt to associate after the Reboot.

Note: The **Association Status** field in the Wireless Settings of the Summary Information page will show the status as **Associated** if the unit has associated successfully, as shown in Fig 2-18a below. Under **Networking | Association Status**, the status will also show the Access Point that the client is associated with, as shown in Fig 2-25b below. Click on **Show Graph** on this table to view the Association Status Graph, as shown in Fig 2-25c below.

Radio : Advanced Settings

airClient TOTAL (sB3416-03) - NAT mode

Advanced Setting	
SSID	NEXUS_MASTER
SSID suppressed	<input type="radio"/> Yes <input checked="" type="radio"/> No
Channel	SmartSelect
Remote AP MAC Address	00:00:00:00:00:00
Wireless Mode	5GHz 54Mbps (802.11a)
Antenna Selection	<input checked="" type="radio"/> Internal <input type="radio"/> External
Distance:	Within 1Km
Country:	UNITED STATES - US
Data Rate(Mbps)	Best
Default Data Rate(Mbps)	1
Transmit Power	18 dBm
Preamble	Long Preamble
Slot Time	Short Slot Time
Protection Mode	None
Protection Type	<input checked="" type="radio"/> CTS-only <input type="radio"/> RTS-CTS
RTS/CTS Threshold	2346

[Save](#) [Reset](#)

Figure 2-24 airClient TOTAL Router Wireless Settings

Wireless Settings	
SSID	Nexus_Master_Root
Channel	Current Channel 52: 5260MHz
Association Status	Associated
Wireless Mode	802.11a

Figure 2-25a airClient TOTAL Summary Information page

Networking : Association Status

airClient TOTAL (sB3416-03) - NAT mode

ID	MAC Address	Status	Signal Strength(RSSI)	NoiseFloor	
0	00:30:1A:1F:4A:2E	up	-55 dBm	-96 dBm	Show graph

[Refresh](#)

Figure 2-25b airClient TOTAL Wireless Association Status

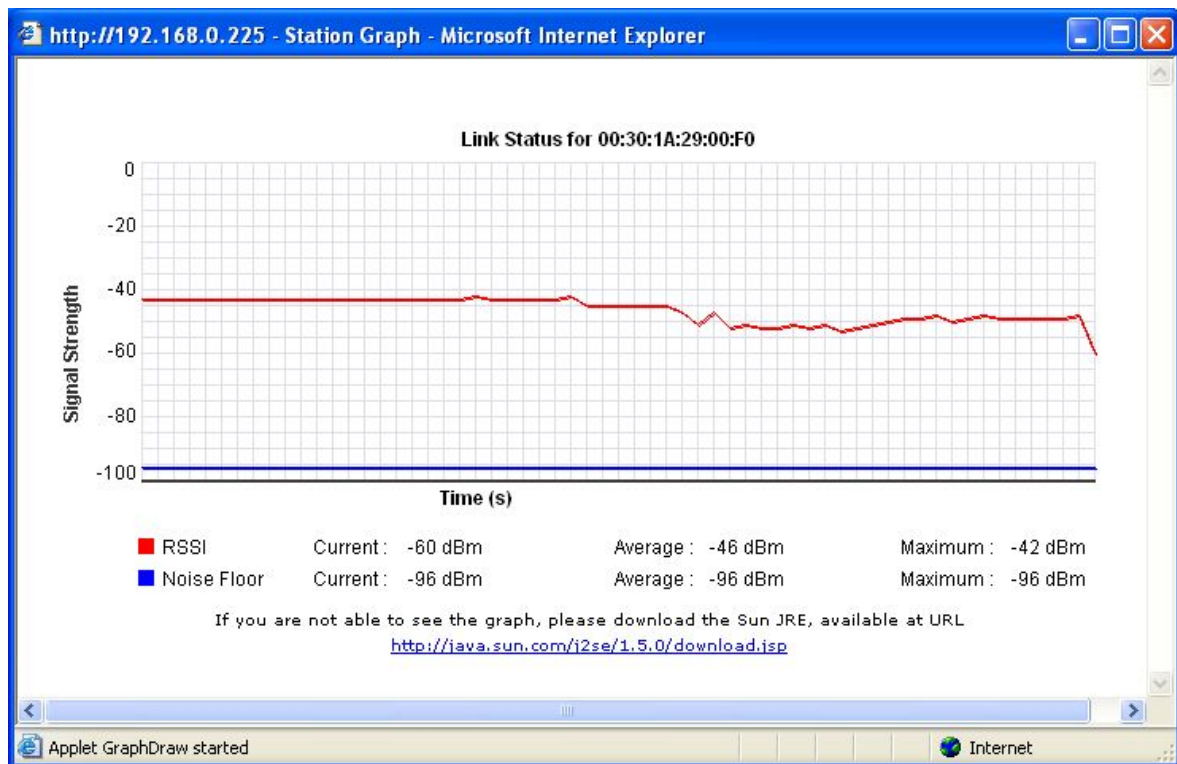


Figure 2-25c airClient TOTAL Association Status Graph

Noise Floor is the measurement of the signal created from the sum of all the noise sources and unwanted signals within a measurement system.

Note: If the Status Graph window does not appear, click on the Java link to download the JRE.

2.10.3. DHCP Configurations

The airClient TOTAL unit can be used as a DHCP server. DHCP (Dynamic Host Configuration Protocol) allows a host to be automatically assigned a new IP address out of a pool of preconfigured IP addresses for the network. This feature will only work when the unit is in Router or NAT operating mode.

Follow the steps below to configure the airClient TOTAL unit as a DHCP server:

-
1. From the Navigation menu bar, click on **Networking | DHCP** to access the DHCP configuration Page. Click on **Enable DHCP Server** button to open the DHCP Server settings page.
 2. The **DHCP Server** screen will be displayed as shown below in Fig 2-26.
 3. Select **System Define** if you wish the system to assign the IP addresses.
 4. Select **User Define** if you wish to assign the IP address from the IP Address Pool.
 5. If setting is **User Define**, enter the **Start IP address** and an **End IP Address** for the IP pool range that can be assigned to a DHCP client. Note that the Start and End IP address have to be in the same network segment as of the Ethernet IP address segment.
 6. In case you require to reserve certain IP addresses for known devices, enter the corresponding MAC and IP address in the **DHCP server reserved entries** table.
 7. Enter the lease time in **minutes**. The maximum lease time that is allowed is 2880 minutes.
 8. Click on **Save** to apply the settings.
 9. The revised DHCP settings will show up in the Summary Information page of the unit. If any DHCP client is added, it will appear in the Networking | DHCP List as shown below in Fig 2-27.
-

Networking : DHCP Server

airClient TOTAL (sB3416-03) - [NAT mode](#)

DHCP : Server Setting
 DHCP Server provides automation and control of IP address assignment services.

☒ Enable DHCP Server
☐ Enable DHCP Relay
☐ Disable DHCP and DHCP Relay

IP Address Pool: ☒ System Define ☐ User Define

Start Address:
 End Address:

Lease Time: Minutes (1-2880Min)

DHCP Server Reserved Entries:(Please fill up by order)

ID	MAC Address	IP Address
<input type="checkbox"/> 0		
<input type="checkbox"/> 1		
<input type="checkbox"/> 2		
<input type="checkbox"/> 3		
<input type="checkbox"/> 4		
<input type="checkbox"/> 5		
<input type="checkbox"/> 6		
<input type="checkbox"/> 7		

Figure 2-26 airClient TOTAL DHCP Server Configurations

Networking : DHCP List

airClient TOTAL (sB3416-03) - [Router mode](#)

DHCP Server : List			
	ID	MAC Address	IP Address
	0	00:30:1a:01:b5:f8	192.168.0.60

Refresh

Figure 2-27 airClient TOTAL DHCP List

Follow the steps below to disable the airClient TOTAL Router/NAT DHCP server:

1. From the Navigation menu bar, click on **Networking | DHCP Server** to access the DHCP configuration page.
2. Select the **Disable DHCP and DHCP Relay** button to disable the DHCP server configuration.

3. Click on **Save** to save the settings. The settings will be applied after the Reboot.

Networking : DHCP Server
airClient TOTAL (sB3416-03) - [NAT mode](#)

DHCP : Server Setting

DHCP Server provides automation and control of IP address assignment services.

☐ Enable DHCP Server
☐ Enable DHCP Relay
☒ Disable DHCP and DHCP Relay

Figure 2-28 Disable DHCP and DHCP Relay

2.10.4. DHCP Relay Configuration

If the user has a DHCP Server, the airClient TOTAL Router can be configured as a DHCP Relay agent of the DHCP Server for IP address assignment.

Follow the steps below to configure the airClient TOTAL unit as a DHCP Relay Agent:

1. From the Navigation menu bar, click on **Networking | DHCP Server** to access the DHCP configuration page.
2. Click on **Enable DHCP Relay** to choose DHCP Relay mode.
3. Enter a valid DHCP Server IP.
4. Click on Save button to apply the settings and to start the DHCP relay agent.

Note: The system will validate the input parameters and notify users of invalid entry.
 The DHCP Server IP will be in the same network segment as the device wireless Radio IP address.
 The DHCP Server needs to be configured to serve IP range of the wired side Ethernet IP.
 The DHCP Relay Agent is only available to hosts connected to the same LAN segment as the device wired-side Ethernet port.

Networking : DHCP Server

airClient TOTAL (sB3416-03) - [NAT mode](#)

DHCP : Server Setting	
DHCP Server provides automation and control of IP address assignment services.	
<input type="radio"/> Enable DHCP Server	
<input checked="" type="radio"/> Enable DHCP Relay	
<input type="radio"/> Disable DHCP and DHCP Relay	
DHCP Server IP:	<input type="text" value="192.168.2.220"/>
<div>Save Reset</div>	

Figure 2-29 airClient TOTAL DHCP Relay Configuration

2.10.5. IP/Port Forwarding

IP/Port forwarding (also referred to as Virtual Server in this document) allows the user to define the port mapping between the local area network and the public network. This feature is only available when the device is configured in the NAT mode.

Follow the steps below to map a local port to the global port (accessible through the wireless interface):

1. Click on **Networking | IP/Port Forwarding** from the menu bar to access the IP Port Forwarding page.
2. Depending on the application, select the protocol as TCP/UDP.
3. Enter the **Local IP Address** and the **Local Port** and the corresponding **Global port** that can be used to access this Local IP/port through the wireless interface.
4. Activate/Deactivate the entry.
5. Click **Add** to add the entry into the IP Port Forwarding Table. This will result in an entry into the table as shown below.
6. Add multiple entries to the port forwarding table if required.
7. Click **Tools | Reboot** to save all the settings. The settings will be applied after the Reboot.
8. Upon the reboot, the total no. of entries in this table will show up in **Summary Information** page as shown in Fig 2-31.

Networking : IP / Port Forwarding

airClient TOTAL (sB3416-03) - [NAT mode](#)

Virtual Server defines the port mapping between Local Area Network and public network.

Virtual Server					
Protocol	TCP <input type="button" value="v"/>				
Local IP Address	<input type="text"/>				
Local Port	<input type="text"/>				
Global Port	<input type="text"/>				
Status	Activate <input type="button" value="v"/>				
					<input type="button" value="Add"/> <input type="button" value="Update"/>

ID	Local IP and Port	Global Port	Protocol	Status	
0	192.168.0.10:21	21	TCP	Activated	Edit Delete

Note: Any change in configurations will take effect after reboot!

Figure 2-30 airClient TOTAL IP/Port Forwarding Table

NAT	
Virtual Server	1 Entri(es)

Figure 2-31 IP/Port Forwarding Table Entries on Summary Page

Follow the steps below to edit or delete a port forwarding entry in the airClient TOTAL operating in NAT Mode.

1. Click on **Networking | IP/Port Forwarding** from the menu bar to access the Port Forwarding Table page.
2. In case you want to edit an existing entry, click on the **Edit** corresponding to the row. The entries will show up in the fields. Edit the entries and click the **Update** button to update the table.
3. In case you want to delete an existing entry from the Port Forwarding table, select the mapping you wish to delete, and click **Delete**.
4. Click on **Tools | Reboot** to reboot the unit for the changes to be effective.

Networking : IP / Port Forwarding

airClient TOTAL (sB3416-03) - NAT mode

Virtual Server defines the port mapping between Local Area Network and public network.

Virtual Server					
Protocol	TCP				
Local IP Address	192.168.0.10				
Local Port	21				
Global Port	21				
Status	Activate				
					<input type="button" value="Add"/> <input type="button" value="Update"/>

ID	Local IP and Port	Global Port	Protocol	Status	
0	192.168.0.10:21	21	TCP	Activated	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

Note: Any change in configurations will take effect after reboot!

Figure 2-32 Editing IP/Port Forwarding Table Entry

2.10.6. Routing Table

The airClient TOTAL Router web-interface has the provision to add, delete or view static routes.

To view the routing table page, click on **Networking | Routing Table** from the menu bar.

To enable dynamic routing, select **Support RIP v2** on the Routing Table page. Dynamic Routing is enabled by default.

Adding and deleting static routes is allowed in the Router Mode of the airClient TOTAL.

Follow the steps below to add a static route entry in the airClient TOTAL operating in the Router Mode.

1. Click on **Networking | Routing Table** from the menu bar to access the routing table page.
2. Enter the **Destination IP**, **IP Mask**, **Gateway** for the new route. Select **Add** to add a new route as shown in Fig 2-33.
3. Select the **Status** to activate or deactivate the static route.
4. Click on **Tools | Reboot** to reboot the unit. The new routes will be activated or deactivated after the Reboot.
5. Upon the reboot, the total number of entries in this Routing Table will show up in **Summary Information** page as shown in Fig 2-34 below.

Networking : Routing Table

airClient TOTAL (sB3416-03) - NAT mode

Routing Mode Selection:

☒ Support RIP V2

Save

You can manually set a routing entry here. Enter the destination IP address and its network mask, and the IP of which port the packets are forwarded to.

Dest IP: 192.168.6.0
 IP Mask: 255.255.255.0
 Gateway: 192.168.0.212
 Status: Activate v

Add

Update

ID	Destination IP	IP Mask	Gateway	Status	
0	192.168.2.0	255.255.255.0	192.168.0.200	Activated	Edit Delete

Note: Any change in configurations will take effect after reboot!

Figure 2-33 airClient TOTAL Add Static Route in Routing Table

Routing Setting
Static Routing 2 Entry(es)

Figure 2-34 Static Route Entries on Summary Page

Follow the steps below to edit or delete a static route entry in the airClient TOTAL operating in the Router Mode.

1. Click on **Networking | Routing Table** from the menu bar to access the view routing table page.
2. From the Routing table on this page, select the route you wish to delete, and click **Delete**, as shown in Fig 2-35. A message will show up, confirming the action to delete the route, as shown below in the Figure.
3. In case you want to edit the existing entry, click on the **Edit** corresponding to the row. The entries will show up in the fields. Edit the entries and click the **Update** button to update the table.
4. Click on **Tools | Reboot** to reboot the unit for the changes to be effective.

Networking : Routing Table

airClient TOTAL (s83416-03) - [Router mode](#)

Routing Mode Selection:

☒ Support RIP V2

Save

You can manually set a routing entry here. Enter the destination IP of which port

The page at http://192.168.0.225 says:



sk, and the



Are you sure you want to delete this?

OK

Cancel

Dest IP:

IP Mask:

Gateway:

Status:

Add

Update

ID	Destination IP	IP Mask	Gateway	Status	
0	192.168.2.0	255.255.255.0	192.168.0.200	Activated	Edit Delete
1	192.168.6.0	255.255.255.0	192.168.0.212	Activated	Edit Delete

Note: Any change in configurations will take effect after reboot!

Figure 2-35 Deleting the Static Route

2.11. Security

This section allows you to configure wireless encryption to prevent unauthorized parties from accessing the network. The security options on the airClient TOTAL are as follows:

1. Open System
2. Shared Key
3. WPA –PSK

Note: By default, security is **Disabled**.

2.11.1. Open System / Shared Key

Open System/Shared Key authentication is used for security between the airClient TOTAL and the airPoint Nexus (or any other access point). To enable, disable or change security settings, the user needs to access the security setting page on the web interface. The following table describes the information for the security settings for the Open System or Shared Key authentication.

Follow the steps below to configure the Data Encryption parameters:

-
1. Click on **Radio | Security** from the main menu, and a screen as shown in Fig 2-36 will be displayed.
 2. Choose the **Authentication Type** as **Open System** or **Shared Key** in the drop down menu.
 3. Choose the **Key Entry Method** as HEX or ASCII. **Key should be HEX when trying to associate with the airPoint Nexus Access Point.**
 4. Choose the **Key length** (64 bits or 128 bits) from the drop down list. For HEX entry method, Key length is 10 characters for 64 bits, and 26 characters for 128 bits.
 5. Enter the **WEP** key in the Key Table entries.
 6. Select the **Key ID** of the index of the key to be used to associate.
 7. Click **Save** to save the settings.
 8. Select **Tools | Reboot** to reboot the unit. The settings will be effective after the reboot
-

Radio : Security

airClient TOTAL (sB3416-03) - NAT mode

Security Setting		
Security Mode	Enable	
Authentication Type :	Open System	
Key Entry Method :	HEX	
Key Entry Instruction:		
<ul style="list-style-type: none"> 64: 10 HEX, or 5 Ascii 128: 26 HEX, 13 Ascii 		
Key ID	Key	Key Length
Key 1 <input type="radio"/>		None
Key 2 <input checked="" type="radio"/>	abcde12345	64
Key 3 <input type="radio"/>		None
Key 4 <input type="radio"/>		None

Figure 2-36 airClient TOTAL Security - Open System/Shared Key Configuration

Table 2-3 Security Settings for Open System/Shared Key

Page Items	Descriptions
Authentication Type	<p>Choose between open system and shared key authentication modes</p> <p><u>Open System</u>: Open System is null authentication. With WEP enabled and valid WEP key on both ends, it provides data encryption.</p> <p><u>Shared Key</u>: Strict authentication for both authentication and data encryption. Clients must provide valid WEP key to associate</p>
Key Entry Method	Choose HEX if the key entered is the Hexadecimal format, choose ASCII if the key entered is in ASCII format.
Key ID	Select one of the key indexes from the 1 to 4.
Key	The value of the encryption key
Key Length	<p>Choose encryption key size between 64bits and 128bits</p> <p><u>64 bits</u>: User has to input 10 HEX digits.</p> <p><u>128 bits</u>: User has to input 26 HEX digits.</p>

2.11.2. WPA-PSK

In order to configure WPA-PSK follow the steps as shown below:

1. Click on **Radio | Security** from the main menu. A screen as shown in the figure below will appear for the **WPA-PSK** settings.
2. Select the **Authentication Type** as WPA-PSK from the drop down menu.
3. Enter the **Key Entry Method** as ASCII or HEX.
4. Enter the WPA-Shared Key in the **Passphrase** field.
5. Select the Cipher as **TKIP** or **AES**. (Note: AES cipher is only available in 3416-03 model).
6. Click on **Save** and click on **Tools | Reboot** to reboot the unit. The settings will take effect after the reboot.

Note: For the 3416-03 model, WPA-PSK security modes will only work when the airClient TOTAL unit is in Router/NAT modes.

Radio : Security
airClient TOTAL (sB3416-03) - NAT mode

Security Setting

Security Mode: Enable
Authentication Type: WPA-PSK
Key Entry Method: ASCII
Passphrase:
Cipher: TKIP

Save
Reset

Figure: 2-37 airClient TOTAL Security - WPA-PSK Configuration

Table 2-4 Security Settings for WPA-PSK

Page Items	Descriptions
WPA-PSK	WPA-PSK is an extra-strong encryption where encryption keys are automatically changed (called rekeying) and authenticated between devices after a specified period of time, or after a specified number of packets has been transmitted. WPA-PSK is far superior to WEP and provides stronger protection for the home or SOHO users. The process used to generate the encryption key is very rigorous and the re-keying (or key changing) is done very quickly. This stops even the most determined hacker from gathering enough data to break the encryption.
Key Entry Method	Key entry method can be HEX or ASCII. To associate with the airPoint Nexus device, this value should be set to ASCII.
Passphrase	This key is used by the client to become authenticated with the airPoint Nexus or any third party WPA capable device.
Cipher	This can be set to TKIP or AES Note: AES is only supported in 3416-03 model.

3. Wireless Settings and Bandwidth Controller

3.1. Wireless Settings

The Wireless Settings can be accessed from the **Radio | Wireless Settings** in the navigation menu bar.

Radio : Advanced Settings airClient TOTAL (sB3416-03) - [NAT mode](#)

Advanced Setting	
SSID	NEXUS_MASTER
SSID suppressed	<input type="radio"/> Yes <input checked="" type="radio"/> No
Channel	SmartSelect
Remote AP MAC Address	00:00:00:00:00:00
Wireless Mode	5GHz 54Mbps (802.11a)
Antenna Selection	<input checked="" type="radio"/> Internal <input type="radio"/> External
Distance:	Within 1Km
Country:	UNITED STATES - US
Data Rate(Mbps)	Best
Default Data Rate(Mbps)	1
Transmit Power	18 dBm
Preamble	Long Preamble
Slot Time	Short Slot Time
Protection Mode	None
Protection Type	<input checked="" type="radio"/> CTS-only <input type="radio"/> RTS-CTS
RTS/CTS Threshold	2346

Figure 3-1 airClient TOTAL Wireless Settings

The following table summarizes the information for the wireless settings.

Table 3-1 Wireless Settings

Page Items	Descriptions
SSID	The network name for the wireless network.
SSID Suppressed	Shows if the SSID Suppressed is Enable or Disabled
Channel	This is not selectable in the current Router/NAT device configuration or Client Bridge Mode configuration (sB3416-03 only). The client will follow the channel of the AP to be associated with. The channel has to be set explicitly in the WDS Bridge Mode configuration (sB3416-03 only)
Remote AP MAC Address	This is the MAC address of the remote Access Point. For WDS Bridge Mode (sB3416-03 only) - This has to be a

Page Items	Descriptions
	valid MAC address. For Router/NAT modes and Client Bridge Mode (sB3416-03 only), this MAC address needs to be set to 00:00:00:00:00:00
Wireless Mode	This is the radio operating mode of the client. This is set to 802.11a.
Antenna Selection	This sets the Antenna to Internal or External.
Distance	The range of the link which corresponds to ACK window size
Country	This allows the selection of a country to change the radio regulatory domain.
Data Rate	This rate at which the operator wants radio to operate. By default, this rate is set to Best .
Default Data Rate	Data rate for transmitting beacons, broadcast and multicast packets. By default, this rate is set to 1 Mbps.
Transmit Power	This is used to set the output power of the radio. The valid radio power range is from 0 to 18 dBm.
Preamble	The radio preamble is a section of data at the head of a packet that contains information the airClient device needs when sending and receiving packets By default this value is set to Long.
Slot Time	This can be set to Long Short Time or Short Slot time.
Protection Mode	Select None, Always or Auto
Protection Type	Select CTS only or RTS-CTS
RTS/CTS Threshold	Default value is 2346 bytes. The range of value is from 256 to 2346 bytes

3.2. Bandwidth Control

Using the Bandwidth Controller, the user can limit the wireless link bandwidth speed. The maximum allowable bandwidth is up to 512Kbps in sB3416-01, 1 Mbps in 3416-02 and 3 Mbps in 3416-03. This is subject to the available upstream bandwidth, signal level and distance.

Note: For the 3416-03 model only, the user can control the upload and the download bandwidth for the wireless link, and control bandwidth on the Ethernet side, based on the IP address or the MAC address of the device.

3.2.1. Wireless Bandwidth Control

Follow the steps below to change the bandwidth parameters, on the wireless side :

1. From the navigation menu bar, click on **Networking | Bandwidth Control**.
2. On 3416-01 and 3416-02, set the **Bandwidth Control** field to limit desired bandwidth, as shown in Fig 3-2. The maximum bandwidth allowable is 512 kbps for 3416-01, 1024 kbps for 3416-02.
3. On 3416-03, you can configure the upload and download limit separately, as shown below in Fig 3.3. The maximum bandwidth allowable on 3416-03 is 3072 kbps.
4. Click on **Save** to save the settings. The settings will take effect after the Reboot.

Networking : Bandwidth Control airClient TOTAL (sB3416-02) - [NAT mode](#)

Wireless Bandwidth Control	
<input type="checkbox"/> Broadcast Packet Filter (F/s)	50
<input type="checkbox"/> Multicast Packet Filter(F/s)	50
<input checked="" type="checkbox"/> Set Bandwidth Control (Kbps)	1024

Figure 3-2 airClient TOTAL Bandwidth Control (sB3416-01 / sB3416-02)

Networking : Bandwidth Control
airClient TOTAL (sB3416-03) - [NAT mode](#)

Wireless Bandwidth Control	
<input type="checkbox"/> Broadcast Packet Filter (F/s)	50
<input type="checkbox"/> Multicast Packet Filter(F/s)	50
<input checked="" type="checkbox"/> Set Download Bandwidth (Kbps)	3072
<input checked="" type="checkbox"/> Set Upload Bandwidth (Kbps)	3072

Ethernet Bandwidth Control:	
<input type="checkbox"/> Enable Ethernet BWC	

Figure 3-3 airClient TOTAL Wireless Bandwidth Control (sB3416-03)

3.2.2. Ethernet Bandwidth Control (sB3416-03 only)

Note: This section is only applicable for 3416-03.

sB3416-03 allows you to limit the amount of bandwidth for each device connected on the Ethernet side, to allow for proper sharing of the bandwidth. The bandwidth on the Ethernet side can be limited based on the IP address of the device, or its MAC address.

Follow the steps below to control the Bandwidth parameters on the Ethernet side, based on IP address:

1. From the navigation menu bar, click on **Networking | Bandwidth Control**.
2. In the **Ethernet Bandwidth Control** settings, click on the **Enable Bandwidth BWC** button to enable the Ethernet bandwidth controlling feature.
3. To control the Ethernet BWC, based on the IP address, enter the IP address of the PC in the **IP Address** field and keep the **MAC address** as 00:00:00:00:00:00.
4. You can configure the upload and download limit separately (in kbps), as shown below in Fig 3.4
5. Click on the **Add** button to add the entry in the table below.
6. Click on **Save** to save the settings. The settings will take effect after the Reboot.

Networking : Bandwidth Control

airClient TOTAL (sB3416-03) - [NAT mode](#)

Wireless Bandwidth Control

☐ Broadcast Packet Filter (F/s) 50
 ☐ Multicast Packet Filter(F/s) 50
 ☒ Set Download Bandwidth (Kbps) 3072
 ☒ Set Upload Bandwidth (Kbps) 3072

Ethernet Bandwidth Control:

☒ Enable Ethernet BWC

You can manually set a ethernet bandwidth control entry here. Enter the device IP address OR its mac address, and the download and upload limit in kbps.

Ip Address	Mac Address	Download (kbps)	Upload (kbps)	
192.168.0.22	00:00:00:00:00:00	512	1024	<div>Add</div> <div>Update</div>

ID	Ip Address	Mac Address	Download (kbps)	Upload (kbps)	
0	192.168.0.10	00:00:00:00:00:00	1024	512	Edit Delete

Save

Reset

Figure 3-4 airClient TOTAL Ethernet Bandwidth Control – IP address based (sB3416-03)

Follow the steps below to control the Bandwidth parameters on the Ethernet side, based on MAC address:

1. From the navigation menu bar, click on **Networking | Bandwidth Control**.
2. In the **Ethernet Bandwidth Control** settings, click on the **Enable Bandwidth BWC** button to enable the Ethernet bandwidth controlling feature.
3. To control the Ethernet BWC, based on the MAC address, enter a valid **MAC Address** of the PC in the place shown in Fig 3.5, and keep the **IP Address** as 0.0.0.0
4. You can configure the upload and download limit separately (in kbps), as shown below in Fig 3.4
5. Click on the **Add** button to add the entry in the table below.
6. Click on **Save** to save the settings. The settings will take effect after the Reboot.

Networking : Bandwidth Control

airClient TOTAL (sB3416-03) - NAT mode

Wireless Bandwidth Control	
<input type="checkbox"/> Broadcast Packet Filter (F/s)	50
<input type="checkbox"/> Multicast Packet Filter(F/s)	50
<input checked="" type="checkbox"/> Set Download Bandwidth (Kbps)	3072
<input checked="" type="checkbox"/> Set Upload Bandwidth (Kbps)	3072

Ethernet Bandwidth Control:

☒ Enable Ethernet BWC

You can manually set a ethernet bandwidth control entry here. Enter the device IP address OR its mac address, and the download and upload limit in kbps.

Ip Address	Mac Address	Download (kbps)	Upload (kbps)	
0.0.0.0	00:30:1A:01:7F:FC	1024	512	Add Update

ID	Ip Address	Mac Address	Download (kbps)	Upload (kbps)	
0	0.0.0.0	00:08:02:63:73:3C	1024	3072	Edit Delete

Save Reset

Figure 3-5 airClient TOTAL Ethernet Bandwidth Control – MAC address based (sB3416-03)

Follow the steps below to update or delete a IP/MAC address entry in the Ethernet BWC table, in the airClient TOTAL.

1. Click on **Networking | Bandwidth Control** from the menu bar to access the Bandwidth Control page, as shown below for MAC based Ethernet BWC in Fig 3-6.
2. In the **Ethernet Bandwidth Control** Settings, click on the **Edit** corresponding to the row you wish to edit. The entries will show up in the fields above. Edit the entries and click the **Update** button to update the table.
3. In case you want to delete the existing entry, click on the **Delete** corresponding to the row.
4. Click on **Save** button to save the settings and to reboot the unit for the changes to be effective.

Ethernet Bandwidth Control:

☒ Enable Ethernet BWC

You can manually set a ethernet bandwidth control entry here. Enter the device IP address OR its mac address, and the download and upload limit in kbps.

Ip Address	Mac Address	Download (kbps)	Upload (kbps)		
0.0.0.0	00:30:1A:01:7F:FC	1024	512	Add	Update

ID	Ip Address	Mac Address	Download (kbps)	Upload (kbps)	
0	0.0.0.0	00:08:02:63:73:3C	1024	3072	Edit Delete
1	0.0.0.0	00:30:1A:01:7F:FC	1024	512	Edit Delete

Figure 3-6 airClient TOTAL Ethernet Bandwidth Control – Edit/Delete entry (sB3416-03)

4. Traffic Statistics

Wireless Statistics can be displayed by clicking on **Networking | Wireless Statistics** from the navigation menu. The following figure shows the statistics page.

Networking : Wireless Statistics		airClient TOTAL (sB3416-03) - Bridge mode
	Recieve	Transmit
Total Bytes:	0	1446861
Broadcast Packets:	0	28860
Multicast Packets:	0	0
Unicast Packets:	0	957
Up Time: Day 0, 2:20:35		

Figure 4-1 airClient TOTAL Wireless Statistics

The following table summarizes the information for the wireless traffic settings.

Table 4-1 Wireless Traffic Statistics

Wireless Traffic Statistics	
Total Bytes Receive	Total no. of bytes received on the wireless interface.
Total Bytes Transmit	Total no. of bytes transmitted on the wireless interface.
Broadcast Packets Receive	Total no. of broadcast packets received.
Broadcast Packets Transmit	Total no. of broadcast packets transmitted.
Multicast Packets Receive	Total no. of multicast packets received.
Multicast Packets Transmit	Total no. of multicast packets transmitted.
Unicast Packets Receive	Total no. of unicast packets received from a specific destination.
Unicast Packets Transmit	Total no. of unicast packets transmitted to a specific destination.
Up Time	Displays the time since the last reboot of the device.

5. Tools

In this section, you will find relevant information for changing the operating mode of the device, saving the configuration, restoring to factory defaults and upgrading the firmware.

5.1. System Configuration

The System Configuration page allows the user to change the operating mode of the unit. Click on **Tools | System Configuration** from the navigation menu bar, to access the System Configuration page. The following figure displays the System Configuration page.

System Configuration : airClient TOTAL (sB3416-03) - [NAT mode](#)

System Configuration	
System Name	SB3416-03
SNMP Configuration	SNMP Configuration
Reset	Reset
SNTP Server	SNTP Server
Firmware Version	2.1.0B0P3_SB3416-03
Local MAC Address	00:30:1a:39:48:3c
Reset To Factory Defaults	Reset to Defaults
Ethernet MTU Size	1500bytes
System Log	Syslog

Current Operational Mode			
<input type="radio"/> Bridge	<input type="radio"/> Router	<input checked="" type="radio"/> NAT	Save

Figure 5-1 airClient TOTAL System Configuration

The following table summarizes the information for the System Configuration page.

Table 5-1 System Configuration Page Items

Page Item	Descriptions.
System Name	Name of the airClient TOTAL.
SNMP Configuration	This field links to the SNMP Configuration page settings.
Reset	This button Resets the airClient TOTAL unit. A message box is prompted to the user to confirm the reboot.
SNTP Server	Allows user to set the Network Time Server and Time Zone
Firmware Version	The version of the firmware installed on the unit currently.
Local MAC Address	The MAC Address of the local airClient TOTAL unit.
Reset to Factory Defaults	This button resets the unit to the factory default settings. A message box is prompted to the user to confirm resetting the unit to factory defaults.
Ethernet MTU Size	Displays the Ethernet MTU size.
System Log	This links to the System Log page settings.
Current Operational Mode	Displays the operating mode of the unit. This could be Router or NAT for sB3416-01 and sB3416-02 models. This could be Bridge or Router or NAT for sB3416-03 model.

5.2. SNTP Setting

The device time comes from the network time information source. The device needs access to a network timer (NTP time server) source. The NTP time server IP can be configured as follows:

1. From the navigation menu bar, click on **Tools | SNTP Setting** to configure the NTP Server. A page as shown below will appear.
2. Enter a valid **SNTP server IP address** and select the **Time Zone**. The default NTP server is 128.250.36.2 and the default Time Zone is Singapore.
3. Click on the **Save** button to configure the NTP.
4. After the Save/Reboot, the network time will appear on the browser, if the NTP server is contactable.

Tools : SNTP

airClient TOTAL (sB3416-03) - [NAT mode](#)

SNTP	
The system gets the current time from SNTP server.	
SNTP Server Address	<input type="text" value="128.250.36.2"/>
Time Zone	<input type="text" value="GMT +8 Beijing,Hong Kong,Singapore,Taipei"/> 
<input type="button" value="Save"/> <input type="button" value="Reset"/>	

Figure 5.2 airClient TOTAL SNTP Time Settings

5.3. Site Survey

From the navigation menu bar, click on **Tools | Site Survey** to access the Site Survey page. A screen, similar to the one below, would show all the standards-based wireless devices operating in the area.

Tools : Site Survey airClient TOTAL (sB3416-03) - [NAT mode](#)

Note: Any change in configurations will take effect after reboot!

ID	Sel	ESSID	BSSID	Wireless Mode	Channel	Signal Strength(RSSI)	Security Mode	Network Mode
1	<input type="radio"/>	Nexus_Master_Root	00:30:1A:1F:4A:2E	802.11a	64	-58 dBm	NONE	Infrastructure
2	<input type="radio"/>	sB_Internet	00:30:1A:1F:49:6E	802.11a	157	-82 dBm	NONE	Infrastructure

Figure 5-3 airClient TOTAL Site Survey

The following table summarizes the information for the Site Survey items.

Table 5-2 Site Survey Page Items

Page Item	Descriptions.
Sel	Allows the airClient TOTAL to associate with a different Access Point
ESSID	The network name for the wireless network.
BSSID	The MAC address of the device
Wireless Mode	Displays the radio operating mode of the device.
Channel	Displays the channel at which the device is operating.
RSSI	Displays the signal strength of the corresponding device.
Security	Displays the security mode that the device is currently operating in. If WEP or security option is enabled on the Access Point, then WEP needs to be enabled on the airClient TOTAL, and WEP key defined prior to association.
Network Mode	Displays the current wireless mode of the device. This could be Infrastructure or Ad-Hoc
Save button	Select a different SSID, and select on the Save button to move to another AP.
Refresh button	Refreshes the Site Survey page

5.4. System Admin

This menu option allows the user to change the User Name and/or password to access the unit. Refer to chapter 2.2 to change the user name and/or administrator password.

The default user name is **administrator** and the default password is **smartBridges** (case sensitive).

5.5. System User

The airClient TOTAL unit allows the user to create Read Only users, to only allow the users to only view the configurations of the unit. This Read Only user cannot edit any configurations, and cannot reboot the unit or restore the unit to factory default settings.

This menu option allows the user to change the Read Only user name and/or password to access the unit. Follow the steps here to change the user name and/or password for this Read Only User –

1. From the top navigation menu bar, click on **Tools | System User**. A System User interface will appear as shown below.
2. Enter the user name you wish in the **Common User** field.
3. Enter the new password in **Password** and **Verify Password** fields. Click on the **Save** button to save the settings.
4. Click on the **Save** button to save the settings.

Tools : System User airClient TOTAL (sB3416-03) - [NAT mode](#)

System User	
Common User Name	<input type="text" value="user"/>
Password	<input type="password" value="*****"/>
Verify Password	<input type="password" value="*****"/>

Figure 5-4 airClient TOTAL Read Only User Configuration

5.6. SNMP Configuration

The user can enable or disable the SNMP configuration using this tool.

Follow the steps below to change the SNMP settings:

1. Click on **Tools | SNMP Configuration** to access the SNMP Configuration page, as shown below in Fig 5-5.
2. **Enable or Disable** SNMP by using the checkbox.
3. Set the **Read Community String** to smartBridges.
4. Set the **System Contact/Location** on the page, if required.
5. Click on the **Save** button for the changes to take effect.

Tools : SNMP Configuration

airClient TOTAL (sB3416-03) - [NAT mode](#)

SNMP Configuration	
Enable SNMP	<input checked="" type="checkbox"/>
Read Community String	<input type="text" value="public"/>
Write Community String	<input type="text" value="netman"/>
System Contact	<input type="text" value="root@"/>
System Location	<input type="text" value="UnKnown"/>

Figure 5-5 airClient TOTAL SNMP Configuration

5.7. Backup/Restore Settings

The Backup/Restore page backs up good configuration settings of the system. This can be used to restore the unit in case of any undesired circumstances.

Follow the steps below to change the Backup/Restore settings:

1. From the navigation menu bar, click on **Tools | Backup/Restore** to save or restore the settings on the unit. A page will appear as shown below.
2. Click on the **Save** button to save the current good settings of the system.
3. In the event the unit needs to be restored, select the **Restore & Reboot** button to recover the settings of unit that was saved earlier. This action will also reboot the system for the new settings to take effect.
4. The user can also save the current settings of the system to the PC through the Ethernet interface. Click **Here** to save the options to a PC.
5. The saved file can be used to restore the system at a later time. (Note: The system will currently only allow a file with the name **apcfg** to be uploaded).
6. By clicking the **FactoryReset & Reboot** button, the unit will reset and go back to the factory defaults.

Tools : Backup/Restore Settings

airClient TOTAL (sB3416-03) - NAT mode

Good Settings	
Save the Good Settings:	<input type="button" value="Save"/>
Restore to the Good Settings:	<input type="button" value="Restore&Reboot"/>

Configuration File	
Backup the current settings to a file. Click Here to save.	
Upload the Configuration File(apcfg):	<input type="text"/> <input type="button" value="Browse..."/> <input type="button" value="Upload"/>

Factory Reset	
Press the button to set all the configurations to factory default settings.	
<input type="button" value="Factory Reset&Reboot"/>	

Figure 5-6 airClient TOTAL Backup/Restore Settings

5.8. Firmware Upgrade

The airClient TOTAL unit firmware can be upgraded from the web management interface.

The latest firmware for airClient TOTAL is available for download from the smartBridges support website at <http://www.smartbridges.com/support/aCT551.asp>.

Follow the steps below to upgrade the airClient TOTAL firmware:

1. Download the latest (or a particular release version) of the airClient TOTAL firmware from the web URL - <http://www.smartbridges.com/support/aCT551.asp> for sB3416.
2. The prefix is the model name of the airClient TOTAL (sB3416-01 / sB3416-02 / sB3416-03). The suffix is the firmware version no.
3. Login to the device web interface. Click on **Tools | Firmware Upgrade** from the drop down menu. The Firmware Upgrade page will be displayed as shown below.
4. Use the **Browse** button to select the location of this firmware file.
5. Click on the **Upload** button to upload the firmware. Wait for around 60 seconds to allow the new firmware to be uploaded to the unit.
6. When the firmware file transfer is completed successfully, a message will be displayed on the web-page, as shown in Fig 5-9.
7. Reboot the unit by clicking **Tools | Reboot** for the new firmware to take effect. (Note: The new firmware will take effect only after the reboot).

Note: During the upgrade period (about 1 minute), the airClient TOTAL unit **MUST NOT** be reset or power cycled. Improper actions can damage the unit.

Tools : Firmware Upgrade

airClient TOTAL (sB3416-03) - [NAT mode](#)

Firmware Upgrade	
Attention: <ul style="list-style-type: none"> ◆ Please upload the correct firmware. ◆ Please DO NOT power off or disconnect during uploading. Improper actions will damage the system. ◆ Please DO NOT close the browser during uploading ◆ Upload will take around 1 minute 	
File Name	<input type="text"/> <input type="button" value="Browse..."/>
Current Version	2.1.0B0P3_SB3416-03

Figure 5-7 airClient TOTAL Firmware Upgrade page

Tools : Firmware Upgrade

airClient TOTAL (sB3416-03) - [NAT mode](#)


Attention: <ul style="list-style-type: none"> ◆ Please upload the correct firmware. ◆ Please DO NOT power off or disconnect during uploading. Improper actions will damage the system. ◆ Please DO NOT close the browser during uploading ◆ Upload will take around 1 minute


Figure 5-8 airClient TOTAL Firmware Upgrade

Tools : Firmware Upgrade

airClient TOTAL (sB3416-03) - [NAT mode](#)

Post Completed

Upload Succeeds.

The file has been uploaded.

[Back](#)

Figure 5-9 airClient TOTAL Successful Firmware Upgrade message

5.9. Product License Key

This feature is used to enhance/upgrade the default bandwidth on the airClient TOTAL units, and to convert the models between sB3416-01, sB3416-02 and sB3416-03.

By default, the 3416-01 allows a maximum bandwidth of 512 kbps, 3416-02 allows a bandwidth of 1 Mbps, and 3416-03 allows a bandwidth of 3 Mbps. Using the Product License Key feature, this default bandwidth can be enhanced to higher bandwidths depending upon the end user application needs.

There might also be a market need to convert an originally bought 3416-01 model to a 3416-03 model with Bridge Mode capabilities. By default, the cross-up gradation between models is not allowed. This means that the 3416-01 model cannot be loaded with a 3416-03 image. It can only be upgraded to future software releases of the same model, i.e 3416-01. However, if a special key is inserted, it is possible to upgrade between models.

The license key is based on the MAC address of the device, bandwidth desired for the upgrade and the model number / name. Follow the steps to convert between models or to enhance the unit to higher bandwidths -

1. Go to **Tools | System Configuration** to read the **Local MAC address** of the unit.
2. Send the MAC Address of the unit, model name of the unit, and the bandwidth needed for the upgrade to smartBridges Technical Support Staff at support@smartbridges.com.
3. The smartBridges Technical Support Staff will generate a unique license key, based on these 3 parameters, and pass the key via email.
4. Click on **Tools | Product License Key** to enter this unique license key and select the **Save** button to apply the settings.
5. If the license key feature was desired for higher bandwidth, the unit would be upgraded upon the reboot.
6. If the license key feature was desired for the cross upgrade of models, the changed model name will appear in the top right corner of the web interface, and it will now be possible to upload the changed model firmware to the unit.

Note: The license key feature will not work if the MAC address of the unit is provided wrongly to the smartBridges Technical Support Staff.

Tools : License Key

airClient TOTAL (sB3416-03) - NAT mode

License Key	
Enter License Key	<input type="text"/>
<input type="button" value="Save"/> <input type="button" value="Reset"/>	

Figure 5-10 airClient TOTAL Product License Key Input

5.10. Link Budget Planning

Link Budget Planning is a very useful tool for link budget estimation.

A GPS Calculator is provided in the Link Budget Planning Calculator page to calculate the distance between an airClient TOTAL unit and an access point.

To calculate the distance between the two, follow the steps below:

1. From the top navigation menu bar, click on **Tools | Link Budget Planning**. The Link Budget Planning web page will appear as shown below in Fig 5-11.
2. Enter the GPS co-ordinates of Station 1 (Latitude1 and Longitude1) and Station 2 (Latitude 2 and Longitude 2). GPS co-ordinates may be entered in DD:MM:SS or DD:MM:SS.SS formats.
3. Select the distance in units (miles or kilometers).
4. Click the **Compute Distance** button to calculate the distance between the two stations.
5. The distance will be displayed in the Distance text box.

Tools : Link Planning

airClient TOTAL (sB3416-03) - NAT mode

GPS Calculator

GPS co-ordinates simplify the task of link planning. GPS co-ordinates may be entered in DD:MM:MM format

GPS Calculator			
Latitude1	Longitude1	Latitude2	Longitude2
<input type="text" value="00:00:00"/> <input type="button" value="N"/>	<input type="text" value="00:00:00"/> <input type="button" value="W"/>	<input type="text" value="00:00:00"/> <input type="button" value="N"/>	<input type="text" value="00:00:00"/> <input type="button" value="W"/>
			<input type="button" value="Compute Distance"/>
Course 1-2 (Degrees)	Course 2-1 (Degrees)	Distance	

Distance from Root Device to Remote Device is (Please Select)

Figure 5-11 airClient TOTAL Link Budget Planning GPS Calculator

Once the distance is computed follow the steps below for the link budget calculations. Alternatively, the distance parameter can be manually entered in miles or kilometers without filling in the latitude/longitude coordinates:

1. Select the **Radio Mode** for station 1 and 2.
2. Enter the **Transmit Output Power** in dBm for station 1 and 2.
3. Enter the **Antenna Gain** in dB for station 1 and 2.
4. Enter the **RF Cable Losses** in dB for station 1 and 2.

5. Click the **Compute Link Budget** button to calculate the link budget information.
6. The link budget information will be displayed as shown below in Fig 5-9.

The link budget information includes the EIRP, Free Space Loss and Theoretical RSSI.

The Receive Sensitivity, Maximum Transmit Power, System Gain and Available Fade Margin at various Link Speeds are also computed and displayed in a table.

The Ideal fade margin for a link is between 10 dB to 20 dB for a stable link base on the environmental condition of a region.

Fresnel Zone Clearance Required will also be displayed.

Distance from Root Device to Remote Device is kilometers

Root Device		Remote Device	
Device :	<input type="text" value="airPoint Nexus"/>	Device :	<input type="text" value="airPoint Nexus"/>
Radio Mode :	<input type="text" value="High Band"/>	Radio Mode :	<input type="text" value="High Band"/>
Tx Output Power (dBm) :	<input type="text" value="17 dBm"/> (-4 to 26)	Tx Output Power (dBm) :	<input type="text" value="17 dBm"/> (-4 to 26)
Antenna Gain (dBi) :	<input type="text" value="18"/>	Antenna Gain (dBi) :	<input type="text" value="18"/>
RF Cable Loss :	<input type="text" value="3"/>	RF Cable Loss :	<input type="text" value="3"/>
		<input type="button" value="Compute Link Budget"/>	
EIRP :	32	EIRP :	32
Free Space Loss :	119.4	Free Space Loss :	119.4
Theoretical RSSI (dBm) :	-72	Theoretical RSSI (dBm) :	-72 (Recommended minimum -75dBm)
Available Fade Margin (dBm) :	9	Available Fade Margin (dBm) :	9
Fresnel Zone Clearance Required : 4.69 meters			
<input type="button" value="Clear"/>			

Figure 5-12 airClient TOTAL Link Budget Planning Calculator

Note: For the SB3416 models, the device can be selected as airClient Nexus.

5.11. System Log

sB3416 allows the System logs to be created locally or remotely on the PC connected to the unit. Local logging is persistent across resets of the 3416-01/02/03 units.

To configure the System Log on the 3416 device, follow the steps below:

1. From the top navigation menu bar, click on **Tools | System Log**. The System Log web page will appear as shown below in Fig 5-13.
2. By default, the Syslog level is set to **Information**. This can be changed to Warning, Information or Debug levels, depending on the amount of information that needs to be logged by the unit.
3. Click on **Enable Local System Log** to enable logging locally on the 3416 unit. You can configure the settings to **Stop Logging**, to stop logging when the buffer is full, or **Auto Delete** to reuse the same buffer, when it gets full.
4. Click on **Enable Remote System Log** to enable logging on the PC connected to the 3416-01/02/03 unit, to allow for remote logging. Enter the **Server IP** to the IP address of the PC, and the **Server port** to the port setting of Syslog server running on the PC.
5. Click **Save** to save the settings.

System Log	
Please Select Syslog Level :	<input type="radio"/> Warning <input checked="" type="radio"/> Information <input type="radio"/> Debug
<input type="checkbox"/> Enable Remote System Log	
Server IP	<input type="text"/>
Server Port	<input type="text" value="514"/>
<input checked="" type="checkbox"/> Enable Local System Log	
When log is full:	<input type="radio"/> Stop Logging <input checked="" type="radio"/> Auto Delete
<input type="button" value="Save"/>	


```

181: <133>00:01:06 System: wireless client NAT mode starting...
180: <133>00:00:06 System: wireless client NAT mode starting...
179: <133>00:01:06 System: wireless client NAT mode starting...
178: <133>00:00:06 System: wireless client NAT mode starting...
177: <133>00:18:21 System: System reboot
176: <133>00:01:06 System: wireless client NAT mode starting...
175: <133>00:00:06 System: wireless client NAT mode starting...
174: <133>00:01:06 System: wireless client NAT mode starting...
173: <133>00:00:06 System: wireless client NAT mode starting...
172: <133>00:10:32 System: System reboot
171: <133>00:01:06 System: wireless client bridge mode starting...
170: <133>00:00:06 System: wireless client bridge mode starting...
169: <133>00:04:02 System: System reboot
168: <133>00:01:06 System: wireless client router mode starting...
167: <133>00:00:06 System: wireless client router mode starting...
166: <133>00:49:38 System: System reboot
165: <133>00:11:46 System: Firmware upgraded
164: <133>00:01:06 System: wireless client NAT mode starting...
          
```

Available Entries Left: 19

Figure 5-13 airClient TOTAL System Log

To refresh or clear the Syslog entries logged locally on the device, follow the steps below:

1. Select **Tools | System Log** from the Navigation menu bar. The System Log web page will appear as shown above in Fig 5-13.
 2. At the bottom of this page, there are two buttons, Refresh and Clear, as shown in the above figure.
 3. Click on **Refresh** button to refresh the logs shown on the web page.
 4. Click on **Clear** button to clear all the logs stored locally on the unit. (Note: Logs once deleted, cannot be retrieved again).
-

5.12. Reboot

The device would need to be rebooted in case any changes are to be made to the system, or a new firmware is downloaded. Click on **Tools | Reboot** to reboot the unit. A figure showing the countdown to 0 will appear as shown below during the Reboot process.

Tools : Reboot

airClient TOTAL (sB3416-03) - [NAT mode](#)

Please wait while the system is Rebooting . . .

20

Figure 5-14 airClient TOTAL Reboot page

Note: The reboot may take around 30 seconds to complete

Once the reboot is complete, click **Here** on the following screen to get the last page prior to the reboot.

Tools : Reboot

airClient TOTAL (sB3416-03) - [NAT mode](#)



Figure 5-15 airClient TOTAL Reboot page 2

This concludes the user guide. For the latest updates, tools and documents to help troubleshoot the sB3416, visit the support section of the smartBridges website at <http://www.smartbridges.com/support/>.

Appendix A – Some useful terms and definitions

Acronyms and Abbreviations	
MAC	Media Access Control
RSSI	Receive Signal Sensitivity Indication
SSID	Service Set Identifier
DHCP	Dynamic Host Configuration Protocol
ACL	Access Control List
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
STP	Spanning Tree Protocol
TCP	Transmission Control Protocol
IP	Internet Protocol
WDS	Wireless Distribution System

SSID

Each ESS has a Service Set Identifier (SSID) used to identify the Radio that belongs to the ESS. Radios can be configured with the **SSID** of the **ESS** to which they should associate. By default, radios broadcast their **SSID** to advertise their presence.

WDS

Wireless Distribution System (WDS) is a system that provides a means to extend the range of Wireless Local Area Network. It allows the creation of large wireless networks by linking several wireless stations with WDS links. To create a WDS link, peer MAC addresses need to be exchanged (as can be done through the Wireless Settings page for 3416-03 Bridge Mode). All stations in WDS should be configured to use the same radio channel and share the same WEP keys, if they are used. smartBridges radios functions as a transparent bridge while operating as WDS links.

WEP

According to the IEEE 802.11 standard, Wired Equivalent Privacy (WEP) is intended to provide “confidentiality that is subjectively equivalent to the confidentiality of a wired local area network medium and that does not employ cryptographic techniques to enhance privacy.”

WEP relies on a secret key that is shared between a mobile station and an access point. **WEP** uses the RC4 stream cipher invented by RSA Data Security. RC4 is a symmetric stream cipher that uses the same variable length key for encryption and decryption. With WEP enabled, the sender encrypts the data frame payload and replaces the original payload with the encrypted payload. The sender then forwards the encrypted frame to its destination. The encrypted data frames are sent with the MAC header **WEP** bit set. Thus, the receiver knows to use the shared **WEP** key to decrypt the payload and recover the original frame. The new frame, with an unencrypted payload can then be passed to an upper layer protocol.

WEP keys can be either statically configured or dynamically generated. In either case, **WEP** has been found to be easily broken.

WPA

Wi-Fi Protected Access (WPA) is a replacement security standard for WEP. It is a subset of the IEEE 802.11i standard being developed. **WPA** makes use of **TKIP** to deliver security superior to WEP. 802.1X access control is still employed. The **Authentication Server** provides the material for creating the keys.

COFDM

COFDM involves modulating the data onto a large number of carriers using the OFDM technique. The Key features which makes it work, in a manner is so well suited to terrestrial channels, includes:

- Orthogonality (the “O” of COFDM);
- The addition of Guard interval;
- The use of error coding (the “C” of COFDM), interleaving and channel-state information

COFDM is resistant to multipath effects because it uses multiple carriers to transmit the same signal.

RIP

The most popular of the TCP/IP interior routing protocols is the *Routing Information Protocol (RIP)*. RIP is used to dynamically exchange routing information. RIP routers broadcast their routing tables every 30 seconds by default. Other RIP equipments will listen for these RIP broadcasts and update their own route tables.

DHCP

DHCP stands for ‘Dynamic Host Configuration Protocol’ and is a means for networked computers to get their TCP/IP networking settings from a central server. Importantly, DHCP assigns IP addresses and other TCP/IP configuration parameters automatically.

SNMP

Short for ***Simple Network Management Protocol***, a set of protocols for managing complex networks. The first versions of SNMP were developed in the early 80s. SNMP works by sending messages, called *protocol data units (PDUs)*, to different parts of a network. SNMP-compliant devices, called *agents*, store data about themselves in *Management Information Bases (MIB)* and return this data to the SNMP requesters.

SYSLOG

In order to track information on events, device jobs, and packets flows, most security devices out put these events using the syslog information model.